MINING CONGRESS JOURNAL

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JULY, 1942

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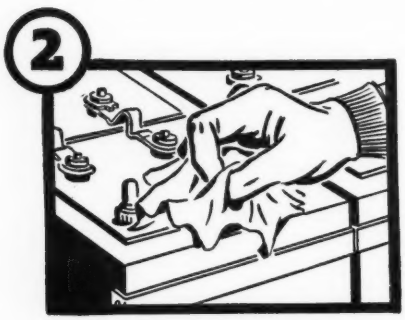
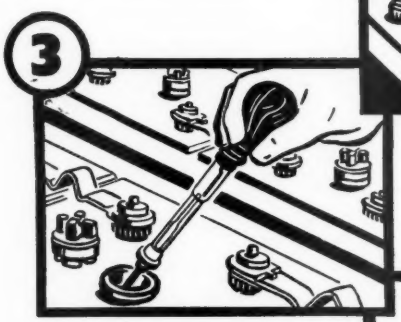


Keep the top of the battery and battery container clean and dry at all times. This will assure maximum protection of the inner-workings.



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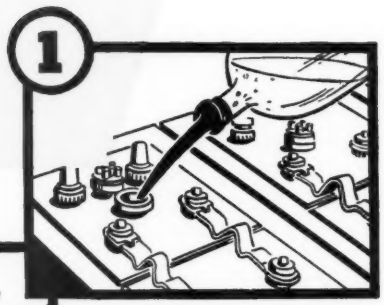

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MINING CONGRESS JOURNAL

Vol. 28 JULY, 1942 No. 7

OUR FLAG

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Headframes of metal mines and tipples of coal properties are flying Old Glory more than ever before. To the people in a mining camp it is an inspiration to behold. A moment devoted to thought on what our flag means to us; to our armed forces scattered over the world, and to freedom-loving people beyond our shores, stirs a patriotism symbolic of the words "United We Stand."

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Opinions expressed by authors within these pages are their own, and do not necessarily represent those of the American Mining Congress

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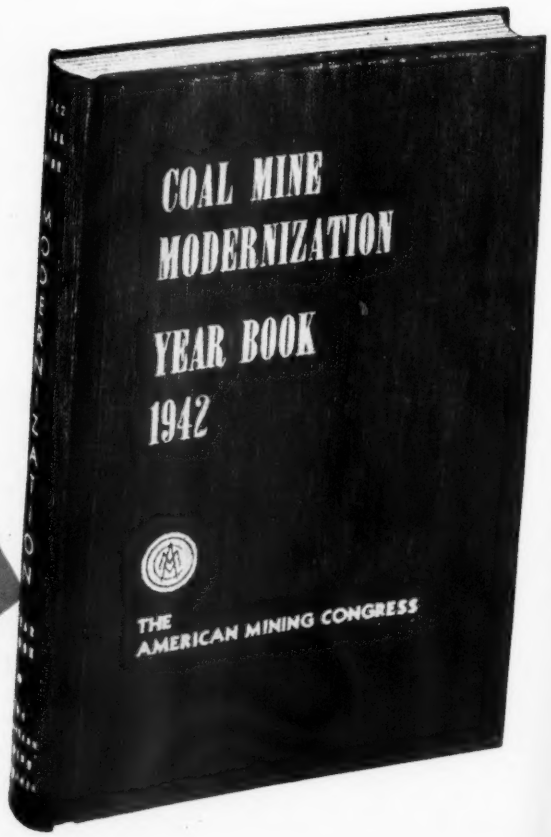

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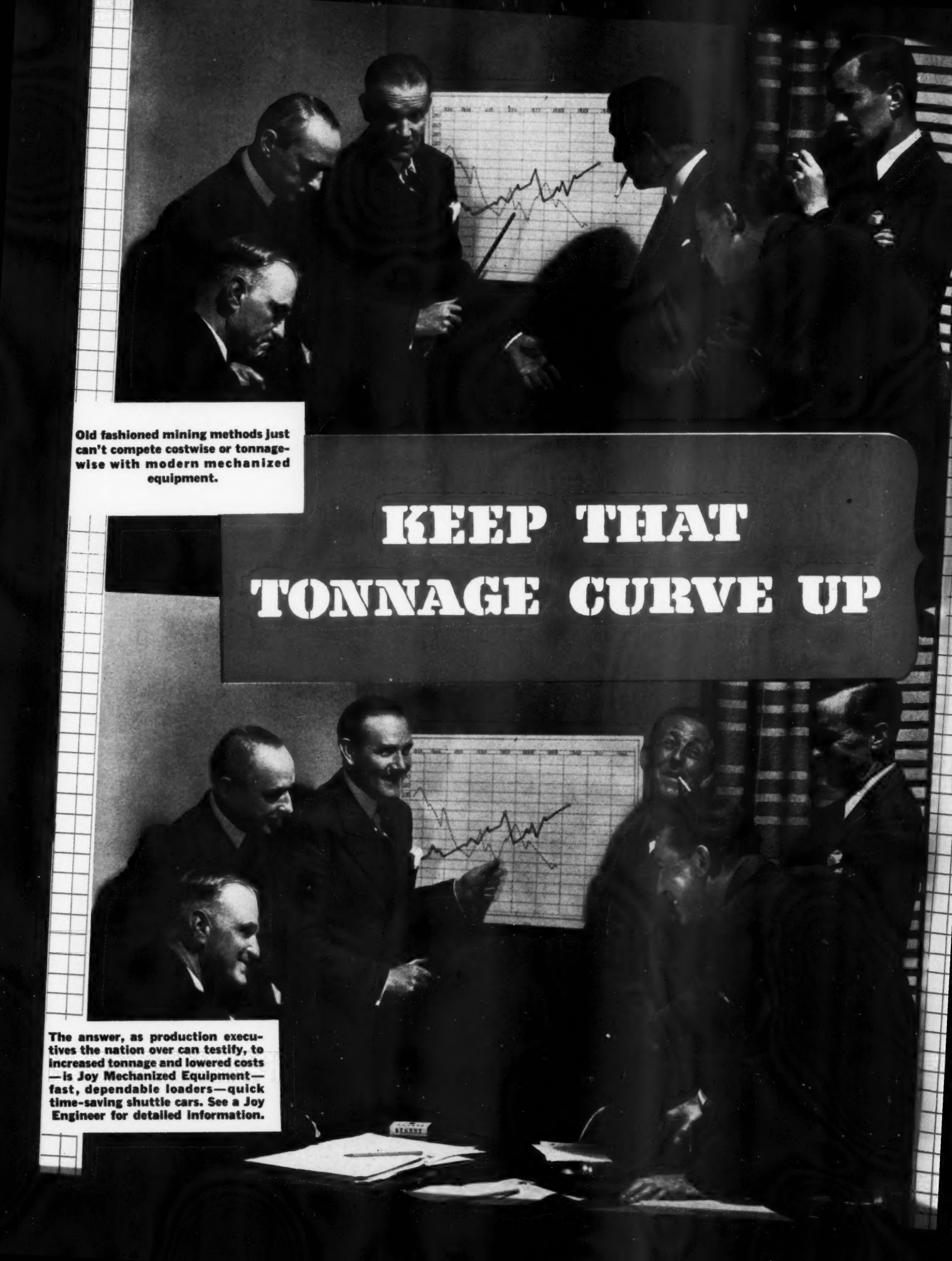

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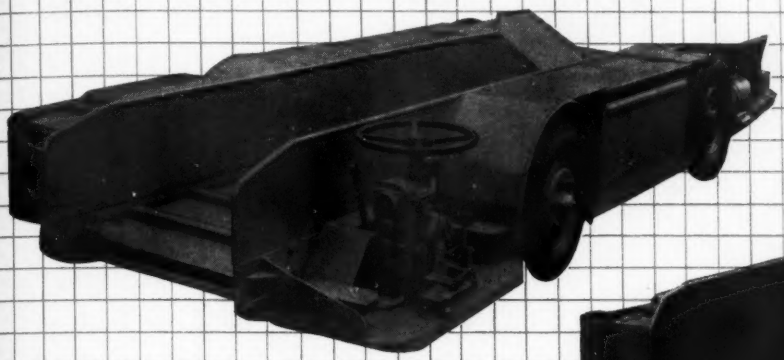

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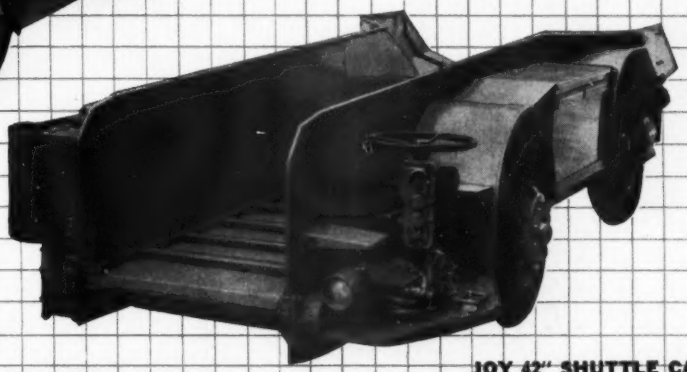

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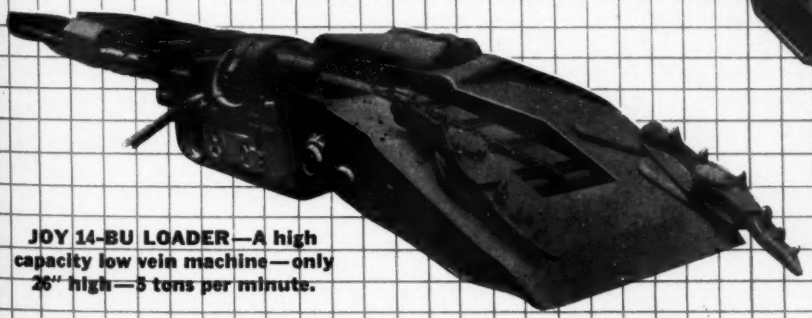

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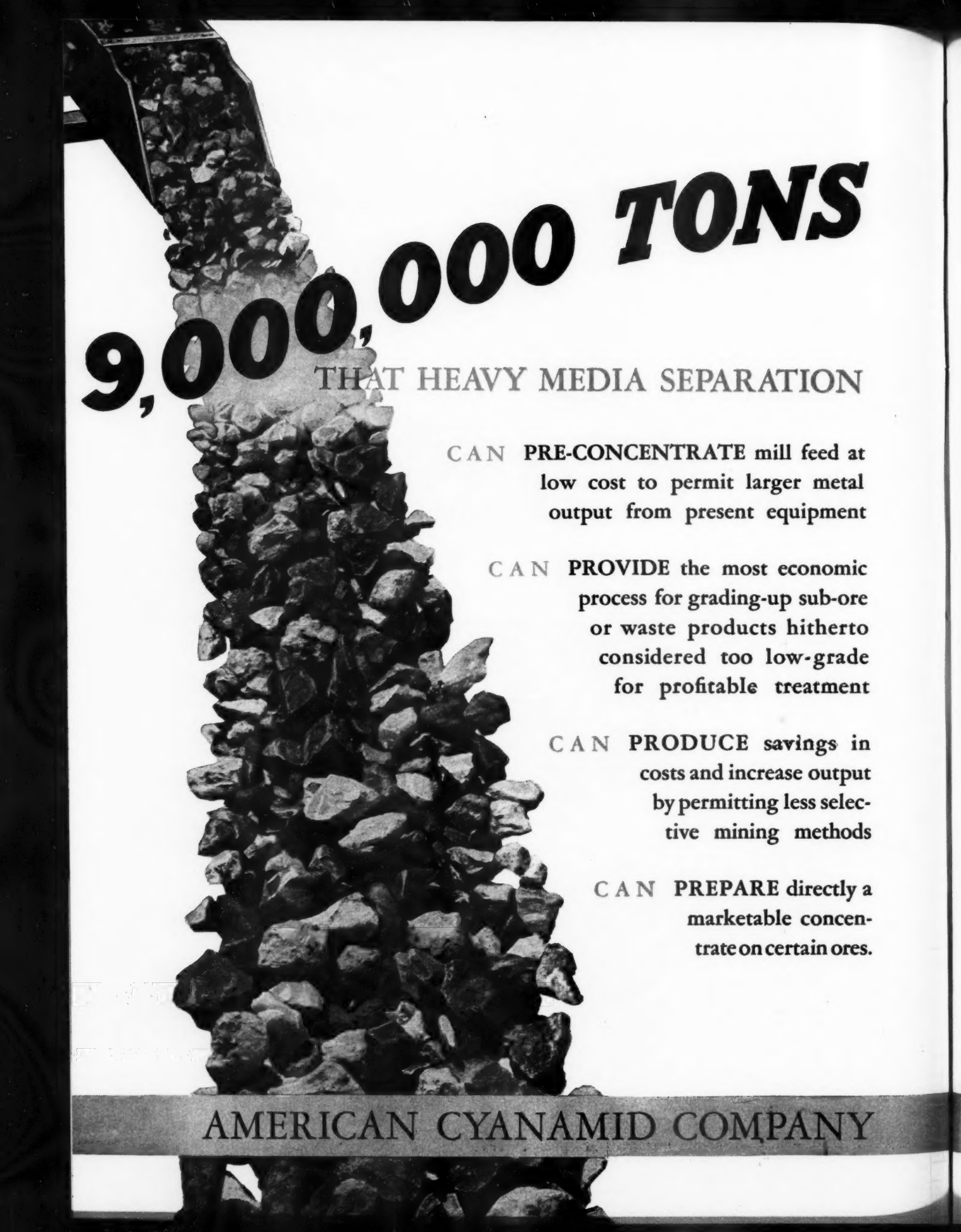

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Dear Pop:

Even an old Rainbow Divisioner like you would pop your eyes at the army we're putting together this time. Let me tell you, they're doing everything to make up just about the best bunch of fighting galoots you ever saw.

And that goes for what they do for us off duty, too! Take this new clubhouse we got just outside of camp. It's got radios, dance floors, nice soft chairs and everything. And, Pop, you can get something to eat that won't cost you a month's pay!

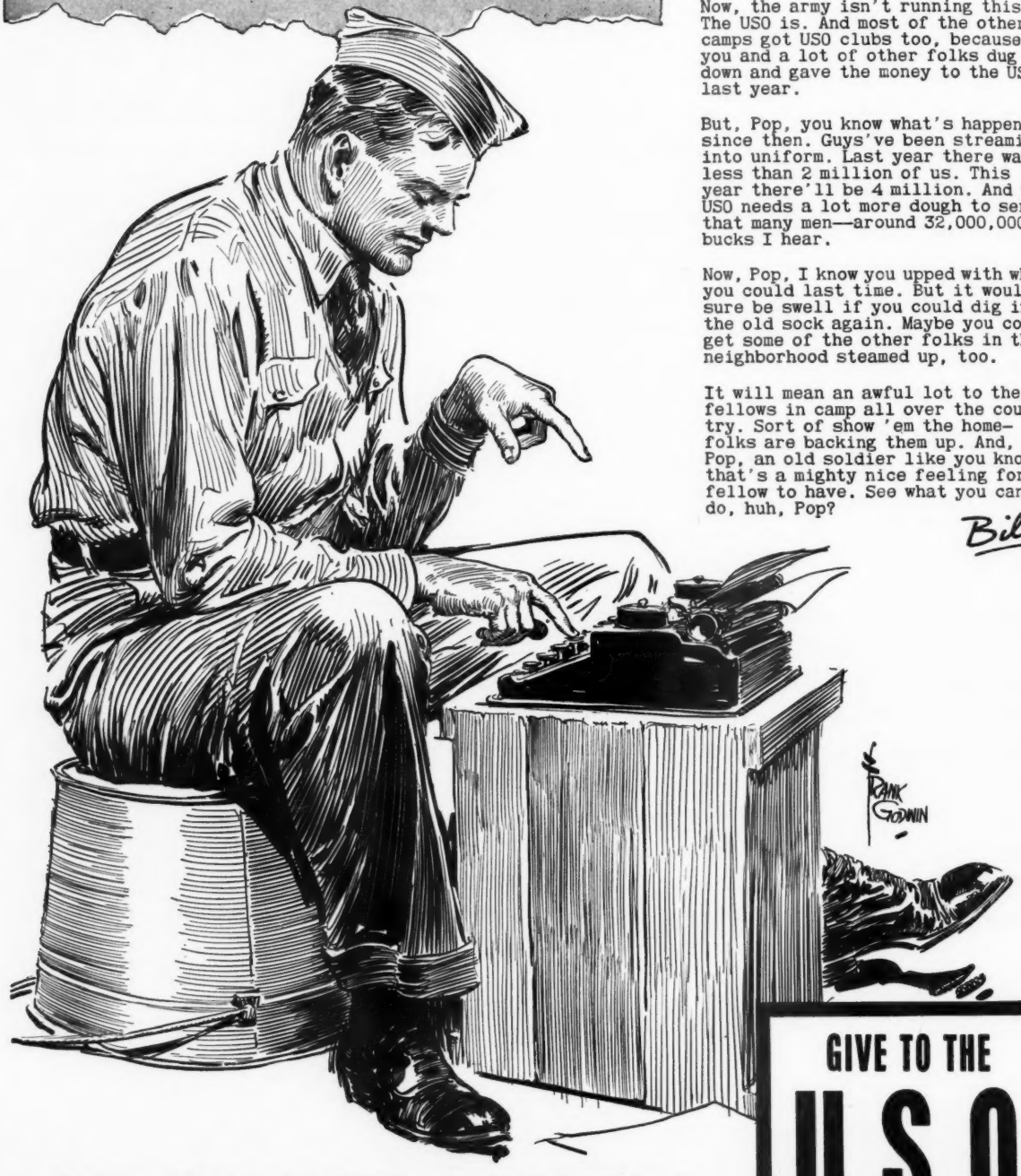
Now, the army isn't running this. The USO is. And most of the other camps got USO clubs too, because you and a lot of other folks dug down and gave the money to the USO last year.

But, Pop, you know what's happened since then. Guys've been streaming into uniform. Last year there was less than 2 million of us. This year there'll be 4 million. And the USO needs a lot more dough to serve that many men—around 32,000,000 bucks I hear.

Now, Pop, I know you upped with what you could last time. But it would sure be swell if you could dig into the old sock again. Maybe you could get some of the other folks in the neighborhood steamed up, too.

It will mean an awful lot to the fellows in camp all over the country. Sort of show 'em the homefolks are backing them up. And, Pop, an old soldier like you knows that's a mighty nice feeling for a fellow to have. See what you can do, huh, Pop?

Bill



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"BEWARE of an America aroused!"

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The world knows now that this "love of luxury" is just a thin outer garment, easily whipped off in an emergency—and that, underneath it, there are muscles of steel.

Sacrifice? We will sacrifice anything but our Liberty!

Suffering? We still remember about Valley Forge, and the blood of our fathers on the snow!

Death? Better death, any day, than life without freedom!

So they said we'd rather lose a war than lose an election? And those cracks, dividing us, were deep craters—not just surface scratches? Management wouldn't work with men, and men wouldn't work with management? And we couldn't get going *fast enough* to become a real factor in this war?

What a jolt the Axis is in for! You might just as well try to sweep the tide back with a broom as try to buck American machines, driven by free, skilled American workers.

◆ ◆ ◆

Inspired by the job our own workers are doing, we view this crisis, not with alarm—but with confidence. Every lathe, every drill, every tool in our plants has been turned into a weapon of war—every worker, man or woman, into a PRODUCTIONEER—a soldier in overalls. Such spirit, such skill, such strength cannot lose—for these men and women are fighting *with their hearts,* as well as with their heads and their hands—fighting, along with the millions of other patriotic workers throughout all America—to STAY FREE!

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A JOURNAL FOR THE ENTIRE MINING INDUSTRY—PUBLISHED BY THE AMERICAN MINING CONGRESS

MINING CONGRESS JOURNAL

HARRY C. CHELLSON
Editor

Vol. 28 JULY, 1942 No. 7

EQUITY FOR THE MINING INDUSTRY

IN WRITING the pending Revenue Bill, the House Ways and Means Committee has at last taken constructive action on two points that have been at issue for a long time.

In 1934, the right to make consolidated returns was removed from the law by amendment on the floor of the Senate, and now eight years later, consolidated returns have been restored in the present bill with the Treasury's blessing, after repeated urging by the mining industry upon members of both Houses. The right to file consolidated returns is penalized by an additional 2 percent in the tax rate, but the equity of the principle is recognized.

Even farther back, in 1932, when percentage depletion was placed in the law for coal and metal mines, the Treasury bound each mining property to a fixed election as between percentage depletion or depletion on a unit basis. A new election was provided in 1934, but the election so made was to govern irrevocably for all future years. Moreover, the election requirement and its application to the "first return in respect of a property" was not made clear to mining taxpayers, many of whom were deprived of their rights through technicalities of administration. Endless controversies and much litigation resulted.

The mining industry has repeatedly pointed out the need, under the fluctuating and uncontrollable economic conditions affecting markets and production costs, for an annual election of percentage or cost depletion. The Treasury has apparently found experience a hard teacher, and as in the case of consolidated returns, has finally approved the amendment urged by the industry to meet this situation. Its wording is extremely simple, and will permit mining taxpayers to swing from percentage depletion (limited to 50 percent of net income) in good years to the unit or cost basis in years of poor earnings. In affording mines a better opportunity to recover their capital value, it will also help to encourage new development and increase production so urgently needed today.

These ten years have afforded a painful lesson. The Treasury has taken a statesmanlike attitude in helping to correct the inadequacy and inequity of its 1932 position.

ABSENTEEISM IN WARTIME

ENGLAND has learned a lesson about her coal-mining industry following nearly three years of war. The demand for coal has become so great that on July 1 the government took over the industry, and more than 11,000 men have been recalled from the armed forces to produce more coal.

Need this event serve as warning to our own coal industry? The general situation regarding coal production so far this year is well in hand, but the industry is moving into the customary peacetime slack season and strenuous effort must be directed to eliminate absenteeism.

It is fitting to review the remarks made by T. J. Thomas, associate director of bituminous coal, Office of Solid Fuels Coordination, this April, at the Coal Convention of the American Mining Congress. He believed the industry could produce the required bituminous and anthracite coal demanded in 1942. He said, "But to meet such a demand for coal without experiencing difficulties, in view of the wartime handicaps, it will be necessary for you to maintain a much higher rate of production during the spring and summer months than has been customary. We must avoid the off-season depression in coal movement this year, so that the load during the peak season will be reduced to proportions that will not overtax war-burdened production and transportation facilities."

Spring is gone, summer is here. Miners in virtually all the coal-mining fields curtailed their vacations to a July 4th week-end so as to maintain maximum output.

That human frailty, more commonly referred to as absenteeism, will no doubt be in evidence during the summer in certain coal-mining sections, but all branches of the industry are cooperating to eliminate this anti-victory habit.

Perhaps coal-mining companies most seriously affected by absenteeism could take a page from the book of the manufacturing company that placed a German banknote in each pay envelope with an explanation saying this was pay for staying home and helping the enemy.

A JOB FOR POSTERS

THE entire mining industry is beset with many problems foreign to its run-of-mine events in peacetime. Labor is scarce; safety first is a watchword; maintenance is virtually a religion more faithfully followed than ever before, and manufacturers are teaching miners to bestow tender mercies on equipment.

Metal and coal mine operators are trying to find answers in the back of the book to relieve these many headaches, but in most cases the solution is usually found elsewhere. For many years, lessons in mine safety have been urging miners to be careful. A method of combating carelessness has been the use of posters, few of which have had effective pulling power or punch.

In wartime there must not be mobilization of merely the second best brains or talents in any field of art, science or industry, but a united action and striking power of the nation's best abilities. Marching in this drive is the recently organized Artists for Victory, Inc., a non-profit organization composed of outstanding painters in the country. They are seeking to arouse the interest and cooperation of the coal and metal mine operators, as well as other branches of vital war industry, to sponsor the type of posters most effectively needed to drive home the requirements of victory for every mine, mill, coal-cleaning plant, and smelter throughout the nation.

Mine operators have no time to become school teachers, but in trying to solve their problems today, they probably appreciate more completely than ever before what the Chinese philosopher meant when he said, "One picture is worth a thousand words."

NEW PRACTICE IN SLATE LOADING RAISES COAL PRODUCTION

A description of a recently developed practice by the Hanna Coal Company in eastern Ohio where the draw slate is loaded at the face with the coal and separated by mechanical cleaning equipment at the preparation plant.

By C. R. NAILLER
Superintendent, Willow Grove Plant
Hanna Coal Company

THE application of machines to coal mining has been developed by a series of steps; the haulage, cutting, drilling, loading, and cleaning were each mechanized as a separate operation, but through the knowledge gained from each of these successive developments our viewpoint has widened and every step of the progress in mechanization has shown that still further possibilities lie ahead. At any rate, that has been the experience of the Hanna Coal Company in eastern Ohio and over the past 10 years we have found that in a modernization program one thing leads onto another. Perhaps it may be better expressed by saying that an improvement in one particular phase will throw some auxiliary phase out of line, and what had formerly been an operation of minor importance may become the operation that is limiting production, or else its cost may be out of proportion to its relative position in the mining plan. The draw slate in Willow Grove mines is a case in point.

Handling a 12-in. Seam of Slate is Expensive

The No. 8 seam at this property has 5 ft. of coal overlaid by a draw slate, averaging about 12 in. thick, which presents a serious roof problem. This is very difficult to timber; sometimes it may stay up for a short time, but it is just as apt to come down either with the shot or during the loading operation. During the past years our practice has been to attempt to hold the top until the cut is cleaned up and then take it down immediately thereafter, as no method of timbering has been successful in keeping the draw slate permanently in place. As a consequence, our mechanical loading operations have had the added burden of the rock work and until very recently we simply accepted this as one of the difficulties which had to be overcome.

The severity of our slate problem will be appreciated by the fact that each loading machine unit crew included six rock men; these men were partly employed in cleaning the coal fall before the machine came into the room and partly employed by taking down and handling the slate after the cut had been cleaned up. In the rooms most of the rock could be gobbed, but in the entries it all had to be loaded into mine cars and hauled to the outside. But even with this amount of hand picking, a considerable quantity of slate would get into the coal, and as a consequence mechanical cleaning was a necessity. The Willow Grove tipple has a modern preparation plant with wash boxes, coal dryers, etc., and as the slate is

A 12-in. draw slate in a 5-ft. coal seam is a serious problem

easily separated, because of its relatively high specific gravity, the cleaning problem was not difficult, but there was a large volume of refuse to be handled.

New Practice Adopted After Two Years of Experimenting

About two years ago our company started an experiment of shooting down the draw slate with the coal, making no attempt to hold or separate it underground and bringing the entire product of mixed coal and slate to the cleaning plant. At the beginning we were not sure ourselves as to just how this would work out, but after two years of experience we have recently come to the conclusion that this method is the most economical for use at Willow Grove mine. As a consequence it is now adopted as a regular procedure and the entire mine is now on the combined slate and coal loading basis. The new practice has, of course, necessitated some change in our operations, and it is true that there is an increased burden on our main haulage underground and in our mechanical cleaning at the tipple, but any disadvantages have been more than outweighed by the advantages of the increased production from the underground loading machines and crews.

Since mechanical loading is more efficient than hand shoveling for coal, it naturally follows that a 12-in. draw slate can be loaded more efficiently by machines than by hand. This is borne out by our experience; for example, with separate slate handling a loading machine unit required six men for taking down and loading or gobbing the stone, but in the combined present operation each machine unit now has only two men for this type of work. These men precede the loaders, removing extra large pieces of rock from the coal falls, and they also follow the loaders, taking down loose slate after the place has been cleaned up.

Number of Rooms in Development Was Reduced

This, however, is only a part of the story as an added advantage is had through the elimination of interruptions and by a sustained regular performance. In other words, when a loading machine crew now go into a face they can operate continuously without stopping to clean fallen rock or to timber the draw slate. Furthermore, the elimination of the separate slate handling reduces the number of

The slate and coal are drilled and shot down together, then the slate is loaded with the coal by machine

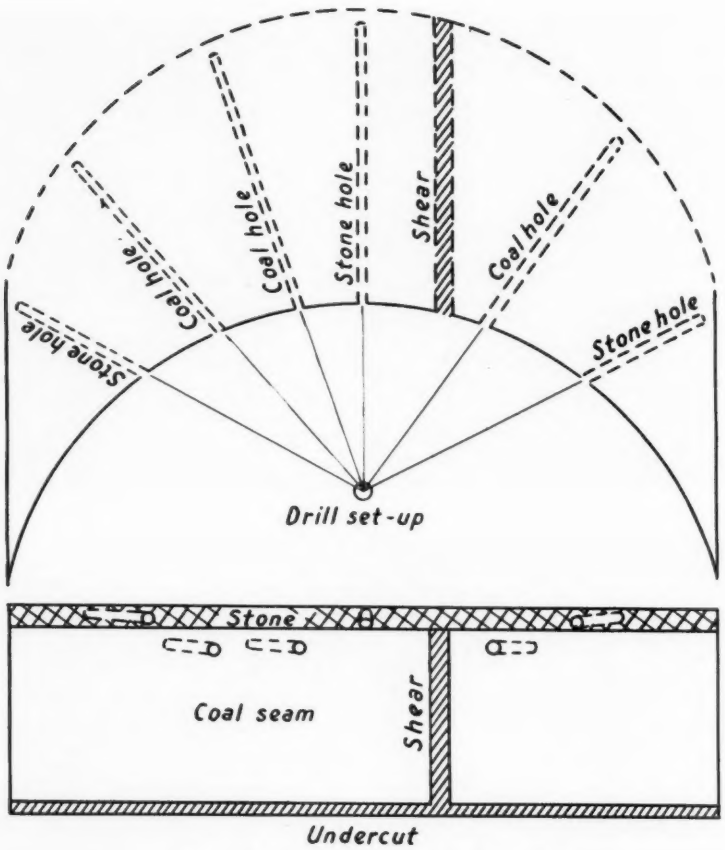


Fig. 1. A single set-up drills both coal and slate

working places in an operating territory; formerly 12 rooms were under development in a panel, while we now have only 10. This decreases the amount of track and mine maintenance.

The entry development, however, has perhaps gained more advantage than the room work. Since it is not possible to gob slate in a heading, the entry advancement was retarded by the additional time required for the extra operation of loading out the rock after it was shot separately from the coal, and it is well known that machine loading becomes more efficient as the loading time becomes more continuous. The slower rate of advancement made it necessary to concentrate an entry machine in a few working places, but in the combined slate and coal loading it is now possible to enlarge the development area and, in addition to driving two entries, one machine unit will also work at least three rooms. As a consequence the former entry development machines produced an average of 80 tons of coal per shift, while the combination room and entry operations now produces an average of about 120 tons per machine shift.

Production of Loading Equipment Greatly Increased

The following figures will show how the new practice has increased the productive capacity of the mine. We have 10 Myers-Whaley track-mounted loading machines, working three shifts per day, and formerly five of these were in rooms and five were in entry development, giving a total capacity of around 1,500 tons a shift. We are now operating six machines in room work and two in combination entries and rooms; a total of eight machines, with less man power than before, and getting the same output as we formerly had with 10 units. The preparation plant, which will be described later, now limits the production to our present tonnage but increased cleaning facilities are being installed which will enable us to operate our 10 loading units and mine about 5,000 tons per day. This will mean an increase of from 12 to 15 percent over our present output, notwithstanding the loss of men to military service and other defense needs.

Plans for Haulage, Drilling and Blasting Carefully Worked Out

There is a point regarding the haulage that may be worth mentioning. The increased quantity of slate coming to the outside does require additional mine-car service but this is not in direct proportion to the added amount of slate loaded. This is explained by the fact that a car full of large pieces of slate naturally has a high percentage of voids, but when slate and coal are loaded together the smaller pieces will fill these voids. Slate, being much heavier, does not occupy the same cubical contents as a similar weight of coal; consequently, the total number of cars needed are no more than the total number of cars which would be required if the slate and coal were loaded separately.

Figure 1 shows the cutting and shooting diagram. The coal is undercut and sheared by an Oldroyd combination track-mounted machine and a single drill setup drills both the coal and the slate. As the figure shows, three holes are in the slate and three in the coal. All blasting is with cardox; the coal shots are fired first, followed by the slate shots. There was some question in our minds as to whether shooting the draw rock would injure the overlying roof strata, which is a conglomerate limestone from 2 to 6 ft. thick. This limestone is rather tender and will eventually come down, but we have found that cardox shooting in the draw slate has not caused any serious damage to the rock strata above.

New Equipment to be Installed in Preparation Plant

The tipple and washing plant, of course, has an added burden, but this is not as great as might be supposed. That is to say, the 12 in. of draw slate which now passes through the cleaning plant is not a total increase because under previous practices it was never possible to keep all of the slate out of the coal and quite a large quantity was always mixed with it. With separate slate loading the total tipple reject would run from 21 to 23 percent, while under present practice this has now been raised to slightly

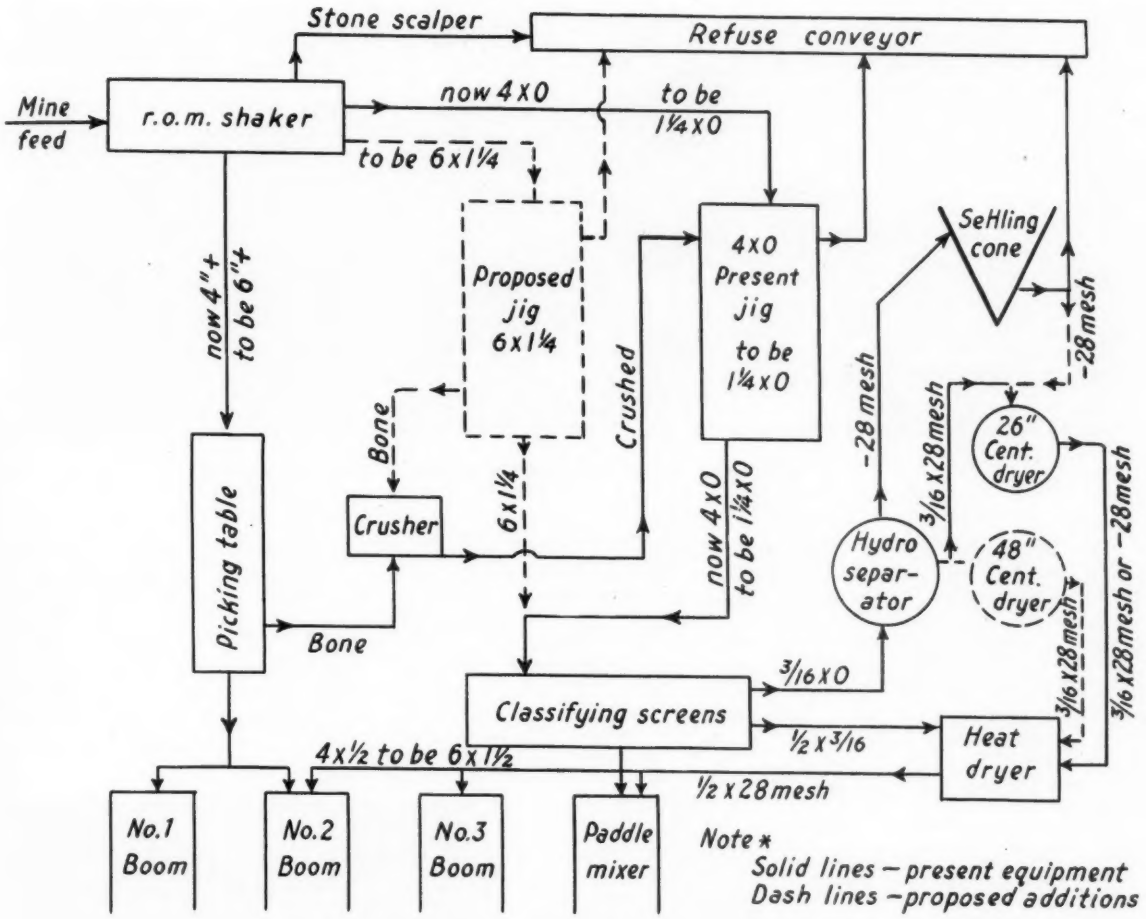


Fig. 2. Flow sheet showing present methods and changes which are under way

above 30 percent. These figures include the bone coal and the slurry from the wash boxes.

The preparation plant was built several years ago and its flow sheet is shown on the accompanying diagram in Figure 2; the present facilities are in solid lines and the equipment to be added is indicated by dashed lines. As now operating, the r.o.m. shaker makes two separations, 4-in. lump and 4 in. x 0; the lump passes over a picking table while the 4 in. x 0 through-product goes to a Simon-Carves jig and thence to classifying screens which may make combinations of several sizes. From the classifying screens the ½ in. x 3/16 in. goes directly to a Roto Louvre heat dryer while the 3/16 in. x 0 is taken to a Dorr hydro-separator. The separator recovers the 3/16 in. x 28 mesh which passes into a C. M. I. centrifuge and from there into the heat dryer, where it is mixed with the ½ in. x 3/16 in. These two products go through a paddle mixer into the railroad car. The *minus* 28 mesh from the hydro-separator goes into a settling cone; the slurry either is sent to the reject or, when market conditions justify, through the heat dryer and then loaded.

A frequent roof condition at the Willow Grove mine where the strata above the draw slate requires substantial support

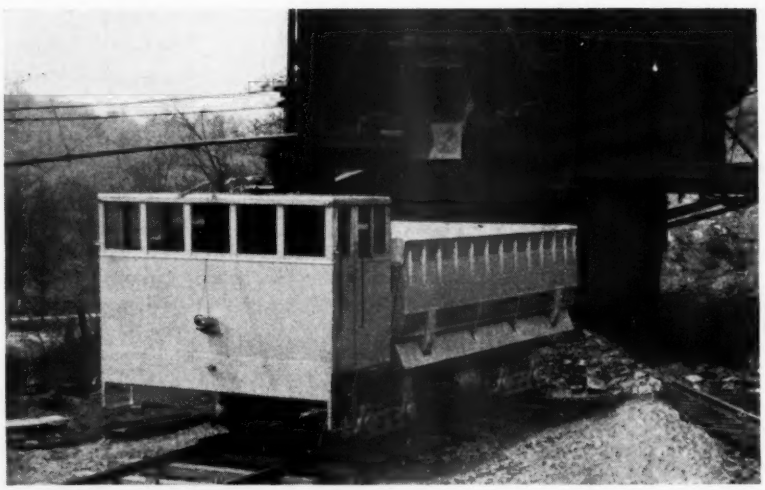
The Willow Grove preparation plant is a modern installation for screening, cleaning and drying coal

The diagram also shows a "Stone Scalper" leading out of the main shaker. This consists of a set of bar screens in the top deck which are spaced wide enough to catch the extra large pieces of slate but allows most of the coal to go through. The over product is discharged on to a flat chute; a man standing at this point diverts any coal back into the shaker decks while the rock goes to the refuse conveyor.

Gain of 200 Tons Per Day Estimated With New Equipment Installed

With the increased quantity of slate to handle, the present washing and drying equipment is badly overloaded and, in an effort to get maximum capacity from our washing equipment, we are sacrificing efficiency in the cleaning job. This results in a loss of clean coal in the refuse, amounting to approximately 125 tons per day. Our drying facilities are also inadequate, with the result that we are unable to properly dewater our entire output and find it impossible to dry the *minus* 28-mesh coal, of which an appreciable quantity would be recoverable. In order to correct these conditions, an additional jig, manufactured by the McNally-Pittsburg Corp., is now being added, and also a 48-in. centrifuge manufactured by Centrifugal Mechanical Industries, Inc., which are indicated by dotted lines on the flow diagram.

When the new equipment is in operation our present preparation procedure will be considerably modified. The r.o.m. shaker will screen three products; 6-in. lump, 6 in. x ¼ in. intermediate, and 1¼ in. x 0. The 6 in. x ¼ in. size will go into the new jig while the 1¼ in. x 0 will go to the present jig. By means of these added washing facilities we expect a more complete separation and a much lower loss in the reject, and the new centrifuge, through larger drying capacity, will enable us to recover as much of the *minus* 28 mesh as the market will absorb. We estimate that, through these new arrangements, the increase in our marketable coal from the preparation plant will amount to about 200 tons per day over our present realization and our slate pickers will be reduced from 11 to 5 men.



A 30-ton Differential Steel Car Company lorry hauls refuse from the tipple to the slate dump

Conclusion

In presenting this account it is not the intention to say that our method can be universally applied but we are simply describing what has proved possible and economical under our own particular condition in the No. 8 seam in eastern Ohio. As previously stated, hand-picking slate underground is costly, the difference in the specific gravities between the slate and the coal makes an easy mechanical separation, and we are simply taking advantage of this situation. We naturally would prefer to keep the top in place, but since many different ways of timbering have not proved successful, and since we were faced with the necessity of handling and bringing an appreciable quantity of rock to the outside, it seemed that mechanical loading and cleaning for the entire seam was the logical answer.

GOOD VENTILATION AIDS MINE OUTPUT*

Record production from iron, copper, lead, zinc and other metal mines requires attention to sufficient air supply.

By E. A. ANUNDSEN
Ventilation Engineer
Pickands Mather & Co.

VENTILATION in metal mines as a group is more or less in its infancy, due primarily to the fact that its need has been recognized only within the last few years. Its progress is somewhat slow since there is still a tendency to plan ventilation after it is required rather than before it is required.

While many metal mining companies have made a creditable improvement in their ventilating systems during the past few years and a few metal mines have had good ventilating systems for 10 or 15 years, the large majority remain poorly ventilated. Most of them remain dependent on natural ventilation, and in many cases compressed air is the source of a substantial part of the fresh air which is available.

At times when production must be pushed to the limit, good ventilation becomes extremely important since it increases the rate at which smoke and dust from blasting is removed, prevents "slowdowns" due to high temperatures and humidities, removes dust produced by operations other than blasting, dilutes and carries away harmful gases, is invaluable in fighting mine fires and shortens shutdowns due to mine fires.

A brief examination of ventilation economics in coal mining is instructive. Coal mines were brought face to face with the necessity of delivering sufficient quantities of fresh air underground to dilute and remove explosive gas. The continued existence of these mines depends on an adequate supply of fresh air properly distributed through the workings. The nature of coal-mine operation is such that the cost of ventilation is a substantial part of the operating cost, while the cost of failing to ventilate is prohibitive. Thus ventilation in coal mines is an operating problem at least as important as drilling, blasting, timbering, hauling and loading of coal. In coal mines the same attention must be given to making ventilation effective and cheap as making any other operation efficient at low cost.

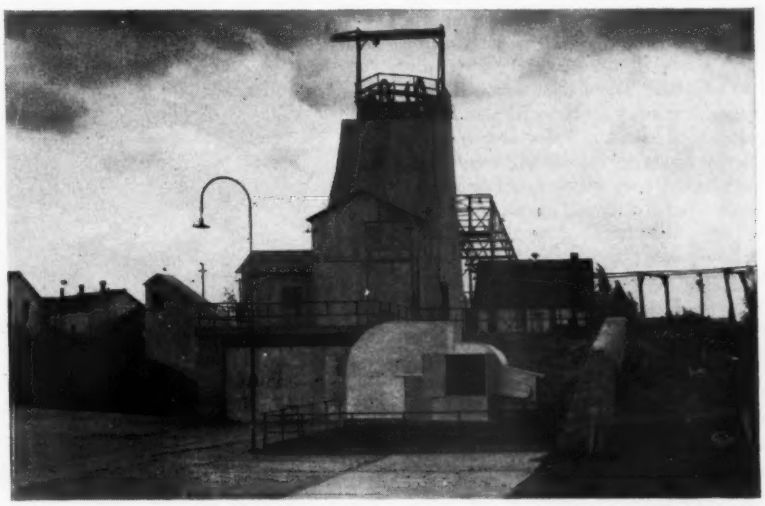
This is not yet the situation in metal mines but there are indications that our ventilation problems and those at the coal mines are not poles apart. The metal mine ventilation problem hinges on health and efficiency and the first metal mines to develop good ventilation systems were those having to contend with extreme heat conditions due to high rock temperatures, fires or oxidation of organic material. A few had to be ventilated because of the prevalence of rock strata gases. However, until the problem of eliminating the mine-dust hazard arose there was no widespread move to effectively ventilate metal mines.

To begin with, metal mines have not been developed for ventilation—they have been developed for the production of ore. Until the production of ore becomes more dependent on ventilation the problem will be to devise methods for forcing air into the working place by means of makeshift arrangements rather than to provide easy paths for the air to follow to the same destination. This method is naturally expensive.

With some types of mining, ventilation has necessarily resolved itself into a relay system with air being supplied underground either by natural or mechanical means and being relayed to the working place by small blower fans. Where the air is supplied by natural means the quantity circulated is dependent on the difference in density of two air columns. That at the higher temperature is displaced by that at the lower temperature and the resulting movement ordinarily varies according to the difference between surface and mine temperature. This temperature differential is limited and is readily upset by changes in surface or mine temperature or by mine fires. It is not dependable and seldom is the air movement sufficient to supply any but moderate requirements.

Both natural and mechanical ventilation are limited by the mine capacity and no more air can be forced through the mine at a given pressure than the capacity of the mine will allow. Since there is an economic limit to the pressure which can be applied, the real "bottle-neck" is obviously the mine itself. The mine capacity can be, and frequently is, increased by eliminating certain obstacles to air travel. The greatest of these obstacles and usually those most

* Presented at the Mine Safety Conference of the Lake Superior Mining Section, National Safety Council.



U. S. BUREAU OF MINES

The housing in the foreground covers a large ventilating fan that supplies this Michigan iron mine with good air circulation

expensive to overcome are restricted passageways. If main drifts are large and reasonably straight they constitute good air courses. Unfortunately many of them are driven in ore and due to the difficulty and the expense of keeping them open ventilation may be sacrificed long before their potential usefulness as an air course is ended. The same holds true for raises. Thus large permanent rock drifts and raises are one of the primary necessities for good mine ventilation. Furthermore, such drifts and raises prove a good investment from the operating as well as the ventilation standpoint.

The mine capacity is further increased by splitting the air so as to make use of a number of parallel air courses. However, this can be carried to extremes and the velocity of the air reduced to a point where smoke and dust are not readily removed.

The mine shafts remain a serious "bottle-neck" in many instances and the need for shafts used solely for ventilation increases directly with the need for ventilation itself. It is well to remember that the air capacity of a smoothly lined, unobstructed shaft may be more than twice that of a timbered shaft having the same dimensions.

The ventilation problem is not necessarily solved when restricted, obstructed and crooked airways have been eliminated, since *air losses* also have an important bearing on the effectiveness of ventilation. In mines already provided with good air courses this factor alone may determine whether or not good ventilation is obtained, for if a mine has capacity for 50,000 cu. ft. of air per minute at a reasonable pressure and the same mine needs 50,000 cu. ft. per minute for adequate ventilation of working places, no air can be wasted. If 30 percent of the air is lost by leakage at the surface fan or through old workings, caves, leaky bulkheads and doors, 30 percent additional air must be supplied so that the working places will continue to receive their quota. This requires a substantial increase in pressure at the fan and increased pressure within the mine. The increase in pressure increases the leakages described, a sort of vicious circle is set up, and furnishing the needed air to the working places may then require a prohibitive pressure at the fan. If the original plans did not contemplate furnishing surplus air for leakage, the surface fan installed may be incapable of supplying the surplus, and the working places suffer in consequence. Obviously, it is cheaper to eliminate the leakage losses than to supply the large surplus of air which is required in the above case.

U. S. BUREAU OF MINES

A steel door for fire and air control in an iron mine in Wisconsin. Note gunited sides and concrete door frame

In the same manner, if the leakage factor is overlooked when installing blower fans with pipe or tubing, the blower fan will seem very inefficient. Actually the blower fan is delivering more air to the pipe or tubing than is expected, but because of leakage less air reaches the discharge end of the pipe or tubing. Consequently, where small blower fans are employed it is economical to use good pipe or tubing, having airtight joints or couplings.

Similarly, booster fans installed underground to act as helpers to the surface fan are subject to large losses through the temporary bulkheads in which they are installed. As a result, the booster fan must not only supply the needed air but must be large enough to supply the losses as well. Thus a booster fan of adequate capacity for the needed amount of air may be very inefficient when supplying both that quantity and the loss due to leakage.

Incidentally, the use of more than one booster fan in a mine usually indicates a faulty main ventilation system and the practice of adding booster fans to various air splits whenever conditions on a split require an increase in air quantity may result in decreased ventilation rather than improvement. As a matter of fact, with a properly designed main ventilation system, air regulators, costing little to install and nothing to operate, will properly distribute the air.

Fortunately, air losses, which are so

U. S. BUREAU OF MINES

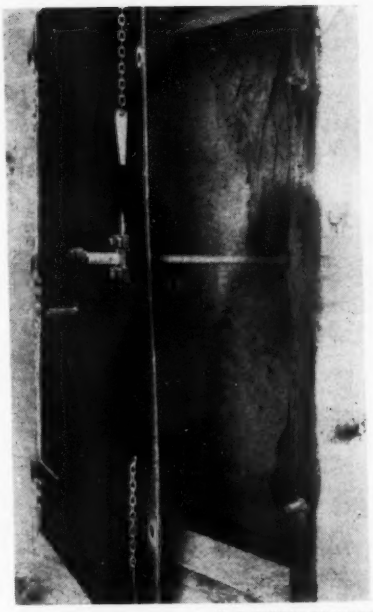
Proper design of the fan tube orifice assures proper circulation of air at the face in this large Montana copper mine

expensive to put up with, can, in most cases, be readily eliminated. The surface fan should be sealed to the shaft or, if all the shafts are required for hoisting, an underground fan should be installed. In the latter case a surface fan also should be in place for use in emergencies. The underground fan should be installed so that it does not recirculate air or constitute a fire hazard in itself, and the emergency fan on the surface should be readily accessible, should be reversible and should be tested at intervals to be sure it is in working order.

To eliminate air losses underground old workings and connections to caves should be sealed off with concrete bulkheads. Wooden bulkheads are rarely tight and should be used only for the most temporary purpose. Concrete bulkheads are especially desirable since sealing off old workings will result in oxygen depletion in the area sealed. Large standing bodies of oxygen-depleted air are very dangerous as they may be suddenly forced into active workings by caves or subsidence, or even by a drop in ventilation pressure such as might occur with the shutdown of the surface fan. A well-built concrete bulkhead would prevent such an occurrence, while one of wood might be ineffective. Oxygen depletion often takes place in unsealed areas and since it frequently has been demonstrated that men will enter unventilated areas where nothing more than signs are provided to prohibit their entrance, it is obvious that abandoned sections should be either sealed or ventilated. Good concrete bulkheads will not only save air which may be needed elsewhere, but will reduce the possibility of oxygen-depleted air entering the ventilation circuit and will eliminate the possibility of men entering dangerous atmospheres.

Ventilation doors are a source of substantial air losses and they should be of steel construction with door frames of concrete. Ventilation doors installed on haulage ways or in any other place where they are frequently opened should always be in pairs to form an air lock, and doors on haulage ways should be mechanically operated, otherwise they will probably be left open. Incidentally, if a good ventilation pressure is available, hand-operated doors may prove a definite hazard unless erected in pairs.

After all the air losses have been reduced to a minimum and a good volume provided, the ventilation of an entire section of a mine may be disrupted by development work which has failed to take ventilation into consideration. As an example, a raise may hole through at some point where an entire air split can be short-circuited through the raise and, unless provisions are made for regulating the flow of air through the raise, work in that section may be seriously handicapped. Certain raises present a constant problem in that it has not yet been found feasible either to keep them full of muck, or to cover or regulate them.



U. S. BUREAU OF MINES

This ventilation door in a copper mine in Arizona has a fixed means of adjusting the air splits. It also serves as a fire door

These points are mentioned to emphasize the fact that a ventilation system is not like a hoist to be installed and operated month after month in the same position and in the same manner. It must be maintained and advanced as are the water, air and power lines. Moreover, it must be planned as far in advance as is the development or eventually there may have to be a costly change in the ventilation system or replacement of a main fan because air requirements were not anticipated.

In planning a ventilation system the question frequently arises concerning the quantity of air that must be supplied. There is no fixed rule for determining this quantity since the ventilation will have to overcome varying degrees of heat, humidity, bad air, powder smoke and harmful dust. This much is true, the total quantity should ordinarily be based on the amount reaching the working place and not that passing through the mine. If a thousand cubic feet of air per minute is supplied each crew (this quantity is probably too low for any but good working places and is decidedly too low for development headings) then the mine should be furnished with sufficient air to supply all of the working places with that quantity of air and, in addition, supply the leakage losses. It also appears advisable to add 10 percent or more to the calculated quantity to allow for error of distribution, and if leakage losses are not easily predicted, this safety factor should be increased.

The quantity of air required cannot always be based on volumes alone since to overcome the inertia of smoke and dust, the air must have velocity. On the other hand, air velocities which are too high add to the ventilation cost since higher pressures are required to produce them. High air velocities also keep dust in suspension and may actually raise dust into suspension. Supplying surplus air to take care of large leakage losses is sometimes a cause for high velocities.

An additional problem is introduced by cold weather and resultant ice formation in intake shafts. This requires heating of air and the heating capacity provided should not be less than that necessary to heat the quantity of air required for good ventilation. Unfortunately, there is a tendency to install heating units which will not warm the required volume of air during coldest weather and the air quantity must then be reduced to fit the heating capacity. Where connections between adjoining mines can be avoided, they certainly should not be made except in the manner that will later permit the installation of good bulkheads or air locks. The doors of the air locks must be constructed so that they can be tightly sealed in an emergency.

The mutual use of air intakes or outlets by adjoining mines is almost sure to give trouble, since a change in the ventilation system at one mine is likely to unbalance the ventilation system in the adjoining mine.

The foregoing deserves much more detailed study by those responsible for ventilation, and there are numerous minor problems which must be solved before top-notch ventilation is obtained. Furthermore, at a time when production demands are at a maximum, ventilation cannot be allowed to lag behind other operations without handicapping the latter. Consequently, future air requirements and means for supplying them should be kept constantly in view at all metal mines.

WARTIME CARE OF MINE EQUIPMENT*

The war is affording mine operators the opportunity for a broader study of costs and service records of machinery and equipment repaired by electric and acetylene welding and metallizing methods.

By EDWARD SCHWEITZER
Lehigh Valley Coal Co.

TODAY proper maintenance is a vital contribution to the war effort as it gains in importance and significance. Maintenance as practiced by the anthracite industry, particularly by the major companies, in the late years has made demands on the technical and operating personnel that is not so obvious today. Interruptions to production due to breakdowns were simply not tolerated. Since the advent of the short work week more time is now permitted to properly maintain equipment and repair breakdowns.

In the not too distant past the anthracite region was dotted with collieries that were outstanding examples of care and maintenance. Well-kept lawns, paved roads, neat buildings—even flower gardens were the order. Equipment was maintained in the same excellent condition, and competition was keen between the various operating groups to fly the banner of merit from their flagpole. This picture has since given way to a more rigid economy, but we cannot help being impressed by the general orderliness of the average colliery.

Although faced with very serious obstacles toward the unrestricted production life of the industry during this critical period, there are many practical methods by which the operators of both large and small plants can control a readjustment program for the reverting from the former free-hand buying to the limited materials now available and which products will undoubtedly be further curtailed as the priority rules and regulations are tightened out of necessity to favor war-production channels.

Other related angles to this war conservation and readjustment program in the anthracite industry should include radical curtailment in purchases of new equipment by reconditioning of present and old; substitution of materials now out of the market and out of proper size; salvaging of materials now in abandoned sections of the mines or in unused plants, and from scrap piles.

To treat all of these related points to the fullest extent of their importance and to include practical solutions would require a presumptuous attitude on the part of the author. But in order to advance this subject as a whole to a stage whereby it can be hoped some benefit can be derived from the cross-section of methods now employed or now in process of organization throughout the industry, some of the practices deemed pertinent are herewith presented.

Attempting to cover the field as a whole, it is impossible to give detailed information on all subjects, but it is hoped that the subject matter presented may suggest other ideas that will prove of value to the industry and be a help to all. It is understood that many pages could be written on proper boiler and stoker maintenance or the care and use of wire rope and other angles of the mining industry.

Welding by electric and acetylene methods has been widely adopted as one of the most successful and admittedly economical plans for saving on purchases of new equipment by reconditioning the old. Some of the common practices now used by this method include rebuilding of flat mine-car wheels. In a specific case some interesting data was revealed in mine-car maintenance by welding flat mine-car wheels. It was found a new wheel gave a life of 117 working days; the same wheel welded once, 108 days; welded twice, 80 days; and welded a third time, only 59 days. From the experience gained it is now the practice to run two new wheels with two welded wheels on the same car and obtain practically the life of new wheels. Balancing a cost of welded wheels at $1.80 per pair against a new wheel cost of approximately $6.75 per

METALLIZING ENGINEERING CO., INC., N. Y.
HUDSON COAL COMPANY

In the shop of the Hudson Coal Company this impeller for a centrifugal pump is being built up to size with a Metco Type 2E metallizing gun, using a special stainless steel wire.

* Presented at the 19th Annual Coal Convention, American Mining Congress, Cincinnati, Ohio.

METALLIZING ENGINEERING CO., INC., N. Y.
GLEN ALDEN COAL CO.

Mine-worn locomotive axles are prepared for metallizing with the Metco rotary shaft preparing tool, after which they are built up to the original dimension with a special metallizing wire called Sprasteel

pair after scrap allowance, the saving is obvious. Rebuilding grooved locomotive tires for both steam and electric locomotives by welding is resorted to with some success.

Many other uses for the welder around the collieries consist of building up grooved slope rollers, sprocket wheels, teeth on roll segments, gears and pinions; building up of rail frogs without removal from the roads; making one locomotive boiler tube from two defective ones; repairing broken engine frames and cast-iron pipe and fitting breaks; making up pipe lines without the use of fittings; building up worn-out pedestals, and many other similar repairs. The use of steel wire instead of the usual welding rod has been found practicable on small acetylene repair jobs.

Many other expedients are employed with success to prolong the life of equipment and eliminate the need for new purchases. Some of the minor items in this category include: Shrinking of bushings on worn car axles and armature shafts; cutting and rethreading of rusted or damaged pipe; making bronze pump parts from scrap piston rods, studs, etc.; relining of bushings for longer life; drilling out and rebushing traction, sprocket and gear wheels.

Among the major items tending to conserve material are the complete rebuilding of steam and electric locomotives; magnet frames or motor casings for electric locomotives when worn loose are built up with tough-wearing rod by electric weld, machined and fitted with new unbreakable bolts at one-third the cost of a new frame; malleable iron heads for these locomotive frames are discarded and new heads of cast steel are furnished at one-half the cost of new malleable iron heads; motor axles of high-grade, heat-treated steel are built up to larger diameter by electric weld on journal-box ends; large teeth on manganese roll segments are sharpened by heating each tooth with the Oxweld torch and hammering to a point; second-hand sheaves of lesser number of grooves are combined to make sheaves with a required larger number of grooves; working barrels on reciprocating pumps, still in service in some mines, are made interchangeable so that one spare working barrel suffices; hoisting sheaves are fitted with steel inserts when rope-worn, doubling the life of the sheaves; jack posts for heavy mine chute jacks are made from short pieces of scrap shafting by adding a short steel end casting (extra heavy pipe failed for these posts); a 5⅜ in. diameter steel shaft requiring one end bumped up to 7½ in. in diameter for about 2 ft., was made by using a steel casting bushing pressed and pinned on the shaft.

Since the entry of our country into the war the anthracite industry, as an aid to industrial conservation, is using more and more a metallizing process to salvage and reclaim worn machinery parts. This process was introduced to the industry during the past year and is proving valuable in the reduction of waste and purchase of new materials almost impossible to obtain due to priority restrictions. Thus far this metal spraying has been used to successfully salvage pump impellers, impeller and casing rings, frame heads for electric locomotives, pump shaft sleeves, armature shafts and locomotive axles.

Pump impeller rings become worn at the periphery where they run inside the casing rings, permitting increased leakage within the pump. Thus it is desirable to maintain minimum clearance, which is accomplished by spraying and refinishing after being turned off and grooved with an unsymmetrical 60-degree thread for the proper anchoring of the applied metal. This application is about 1/16 in. thick, after which the rings are then finished to the original size. All of this work can be done without removing the impeller ring from the impellers.

Casing wearing rings are more conveniently repaired by removing the ring from the casing. These rings are of bronze or chrome iron and are repaired with a ⅛-in. stainless steel wire which provides a wearing resistance equal to or greater than the original material.

Pump shaft sleeves of bronze or stainless steel wear on their surface where contact is made with the packing and require treatment by spraying, the same as impeller and casing rings; pump impellers become worn where the ring is seated due to erosion, thus destroying the fit to which the rings are first made, necessitating the building up of the seat, which is accomplished in the same manner as with wear on the rings.

Armature shafts are usually worn at the bearings and are rebuilt with 0.10 carbon-steel wire which hardens sufficiently to provide satisfactory resistance to wear.

Locomotive frame heads are supported in the split motor frame by a circular tongue and groove type construction. The groove in the head, after wearing, is rebuilt with an iron wire so as to be easily machined. The circular tongue in the motor frame is more conveniently rebuilt by torch welding. The ball-bearing seats in the frame heads are also sprayed with iron wire and reconditioned. Roughly, the

cost of this work generally amounts to from 25 to 50 percent that of a new part.

A detailed description of this process as applied to reclamation of locomotive axles by one of the largest anthracite producers may be of interest. The axle was 4 in. in diameter and the worn journal to be built up was approximately 8 in. long. The shaft was placed in a lathe and an undercut of .045 in. was taken on the full 8 in. The area to be sprayed was then rough threaded with a U tool and a special rotary tool was run across the grooves to roll over edges to form dovetails which hold the sprayed metal. Blasting with metal grit is not required for cylindrical parts that can be rotated in a lathe.

The metal wire used was 0.25 in. carbon steel and the metal coating was deposited on the axle with one transverse of the spray gun across the surface to prevent oxidation developing between layers sprayed over each other. The gun was placed on the lathe feed and the process continued until the metal was deposited to a thickness of .015 to .025 in. over the finished diameter to allow sufficient metal for turning or grinding to a smooth surface.

The preparation time required 30 minutes, spraying time 40 to 50 minutes, and grinding or turning time 40 minutes. The total cost was approximately $2.50. A new axle costs $18. Around 300 of these axles have been thus treated in a year and operating reports claim the sprayed metal gives better life than the original metal. The metal spray is particularly applicable to building up worn parts that cannot be welded on account of distortion or affecting heat treatment.

Reclaiming essential materials from abandoned mine sections and plants will aid considerably in replenishing stock for maintenance and new construction work. Track rails and fastenings, switch points and frogs, sheet iron, column pipe, belting trolley wire and cable, miscellaneous scrap such as screen jackets, car wheels, bolts, nuts, wire rope, etc., can be gathered and placed on orderly piles for assimilation back into service. Small hoists, compressors, pumps, etc., which were considered obsolete can be reconditioned or parts removed for uses in reconstruction of rebuilt models.

Salvaging of anti-freeze chemicals by draining the radiators of company cars and trucks and storing in barrels for next winter's use, when by adding a small quantity of new chemicals the proper mixture can be obtained.

The real value of such conservation, of course, lies in the salvaging of materials before they have had an opportunity to become useless. It is imperative to avoid unnecessary waste and it becomes increasingly important for men in responsible charge of operation to use and reuse material.

Substitutes for materials in common use, such as manila or hemp ropes, bronze and brass fittings, wire-bound rubber hose, stainless steel and copper are essential and they will not be available on the market as their shortage will become more acute.

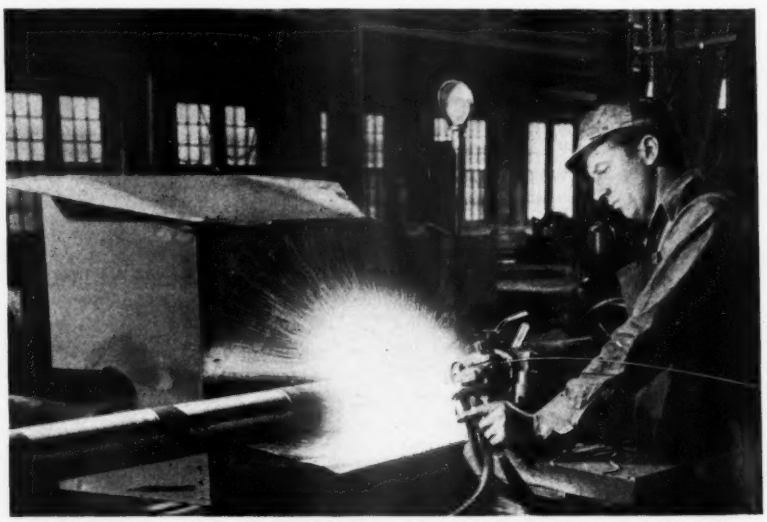
Sisal rope is now replacing manila or hemp rope for transmission drives. Rope drives are not now in general use, but for those that are it is recommended that where it does not necessitate the purchase of new sheaves, the next larger size rope should be used. Sisal rope runs approximately the same number of feet per pound and has about 80 percent the tensile strength of manila rope. For equal strength a sisal rope is cheaper than a manila rope. Test installations of sisal rope drives indicate very satisfactory service.

Other items requiring substitution in whole or in part are: Replacement of bronze valves with iron-body, bronze-mounted valves; fire hose is purchased without brass connections—the old connections being attached to the new hose; bronze sleeves replace chrome iron on pump shafts; plain hose is replacing wire-bound hose (now virtually impossible to secure) for jackhammer lines, the pressure having been reduced to prevent bursting and to add to its life; reduced pressure seemingly operates successfully.

Rubber pipe, while still obtainable, has been substituted or placed in service where cast-iron and steel pipe have been giving short life. Pinch valves made of rubber pipe, with mechanism to close this rubber pipe, have been placed in service where metal valves failed to give long service. The substitution of rubber for metal in those places where the water handled is acidulous and contains abrasive materials, has proved successful due to longer life of the rubber pipe and pinch valves.

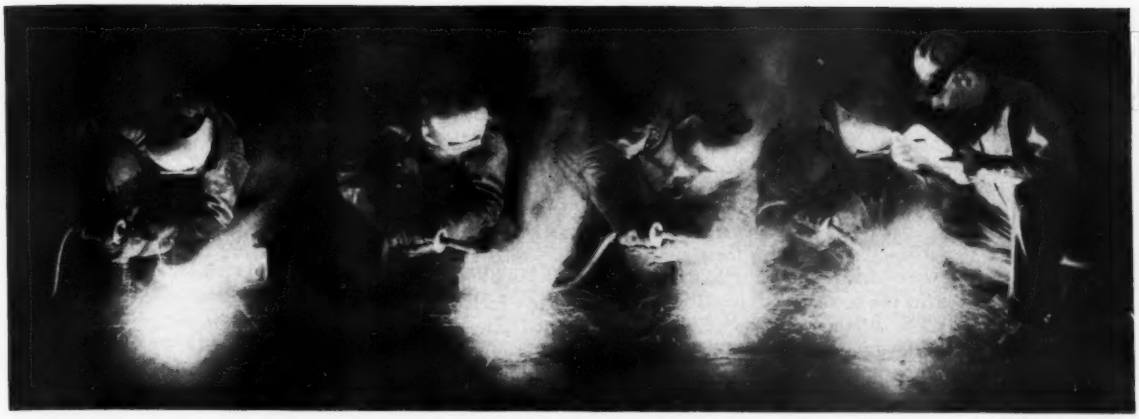
In some sections of the industry the following substitutes have been put into service: cotton bags instead of burlap; brattice cloth replacing cotton duck; excelsior for scrap burlap; larger portions of iron and steel fittings replacing non-ferrous material; larger portions of steel screen segments in place of bronze, copper, or stainless steel.

Maintenance methods and conservation of materials as applied to the anthracite industry, and undoubtedly to many kindred industries, will soon mean more than the mere words imply. It will become increasingly imperative to impose a closer inspection of plants, curtail unnecessary waste and apply more stringent economy to the end that the industry may always stand ready to supply our nation's need for clean, healthful, dependable fuel, and not be found wanting in its contribution to victory.



METALLIZING ENGINEERING CO., INC., N. Y.
GLEN ALDEN COAL CO.

The metallizing gun is shown here building up worn sections on a mine locomotive axle at Glen Alden Coal Company. After metallizing, it will be ground down to finished size with a special lathe grinder



Industry is teaching the correct technique of welding to thousands of men

U. S. STEEL CORPORATION

WAR SENDS THE COAL MINER TO SCHOOL

Modern vocational education covers all phases of mine operation, care and repair of the coal industry's mechanized equipment. Improved mine safety, greater efficiency and increased output for the war effort, as well as peacetime benefits, are expected to result from this growing trend of upgrading men.

By D. C. JONES

Supervisor of Mining Extension
The Pennsylvania State College

THE present national emergency has placed the coal mines of the nation in a position of extreme importance. If we are to maintain our great transportation systems, our widespread manufacturing plants, our huge steel mills, and our vital power plants at their respective peaks of production, it is essential that coal be furnished them without letup. Any factor which can aid in maintaining the present level of production or increasing it to higher levels if necessary is worthy of consideration. Vocational training of miners "on the job" is a factor which the author believes will be of material assistance in solving certain problems arising in the coal industry and thus aid our national war program.

Some of the general problems which now exist in the industry as a result of our country entering the war involve man power, skilled labor, machinery, and supplies. There are many other types of coal mining problems but those listed can be partially solved by the application of properly administered training programs.

Up to the present time there has not been a noticeable decrease in coal production because of the loss of man power through the armed service draft. This stability in production may be due to the increased use of mechanized mining equipment or to more efficient use of the mechanized mining equipment already in use or to more efficient operation of the mines as a whole. Double- and triple-shifting of equipment has also contributed to these high production records.

A reduction of 10 to 20 percent of the skilled labor force in any one mine may well result in an equal or even larger percentage of reduction in the coal output, especially where the mine is partially or fully mechanized. This group of skilled labor should include the mechanics or maintenance men, for their services are vital to keep equipment in operation. The loss of a good mine mechanic is serious, and the percentage of mine workers available who can be trained within a period of one year to perform the tasks required of a mine mechanic is low. The loss of a large number of machine operators at any one mine would also be detrimental to production. However, the training of new men to replace operators does not require much time, so this problem cannot be ranked in importance with that of replacing mechanics. Supervisors, including face bosses, section bosses, and foremen, might also be included

with the skilled-labor group. Men attain these positions of responsibility only after years of experience, and in most States this type of work requires that the person be certified to perform these tasks. In mechanized mines the supervisory force needs training of a different nature than for hand-loading conditions, for there has never been enough men with the proper training to satisfactorily serve those mines which were either completely mechanized or in the process of being mechanized. The problem of supplying bosses for mechanized mines may become fully as important as that of supplying mechanics for the same types of mines.

Care of Mine Equipment Must be Stressed

Mine equipment now in use must be handled carefully to make it last as long as possible, and it also means that equipment which was formerly used on one shift must now be used on two or three shifts. Keeping such equipment in working shape requires the employment of trained mechanics, and it likewise demands the use of properly trained operators who will not abuse the machines under their control and who will be able to make minor adjustments and repairs so as to lighten the maintenance load on an overworked repair force.

The problem of supplies is already a vexing one, and it will become increasingly so in the future. Maintenance forces at many mines are well prepared to make extensive repairs to equipment provided they have the necessary materials, and the ingenuity of the mine mechanics who can almost "make something out of nothing" is a never-ceasing source of wonder. There is a limit to such ingenuity though, for there is no substitute for rubber to repair cables or make insulation repairs. When the lack of supplies forces a machine into idleness or makes its use under gaseous conditions a hazard, then production will fall, accidents will increase, and hazards will multiply. Better handling and care of equipment will reduce the need of certain hard-to-obtain supplies, and training programs which emphasize these points will assist in solving the supply problem.

The coal mining industry has been extremely negligent in the training of employes for specific jobs requiring certain skills. This criticism is not directed at the efforts of the industry in training men for officials' positions or in the giving of instruction in first-aid and mine-rescue work. Night mining classes have been conducted in a number of states, either by state universities or state departments of mines in cooperation with state departments of public instruction, and in such classes many mining men have been prepared each year for the state examinations for certificates of competency as fire bosses, assistant mine foremen, and mine foremen. The value of such training will be recognized from the fact that each year approximately 5,000 men attend classes in the neighboring states of Maryland, West Virginia, and Pennsylvania, and the training programs in other coal-mining states will swell this figure to a respectable total for the entire country. First-aid and mine-rescue training programs, sponsored largely by the United States Bureau of Mines, have been widespread, and the training received has served to alleviate much of the suffering resulting from mine accidents and prevent their recurrence. These programs, however, have been either of a general nature or, where specific training was given, the trainee did not use his newly acquired skill in doing his every-day job.

Various Programs Under Way Regarding Maintenance

Within the past few years there has been increased interest in the development of training programs directed to reduce maintenance costs of equipment. Initially this was due to the lack of men trained to operate and maintain the increased amount of equipment which mechanized mining had introduced into the coal mines. Lately the industry has recognized the fact that unless something is done it will be extremely difficult to keep the equipment operating at the pace required by our war requirements. Certain of the programs in operation have had as a goal the development of mechanics capable of maintaining equipment; other programs have dealt with the general up-grading of the men who handle the equipment; still other programs have included training of foremen to give them a "mechanically-minded" attitude and provide them with a background of knowledge so they could operate their sections on a "factory" basis instead of continuing with the methods which were found most suitable for hand-loading mines. In some instances these program goals overlap for, as first-aid training is also accident-prevention training, instruction on the proper care and operation of a machine also results in increased production and better maintenance.

Mechanized Coal Mines Require Well Trained Mechanics

Modern coal-mining equipment is much more intricate than that in use 10 or 15 years ago. Controls of the contactor type are in use on both mobile loading machines and conveyor equipment. Many machines now use hydraulic control of certain operating functions. The old-style mechanic is helpless in the face of such complicated mechanism, so training of mechanics to handle modern equipment is not merely a good thing but an absolute necessity. One training program designed to meet this specific need is that in operation by the Rochester and Pittsburgh Coal Company at their Snyder shop near Indiana, Pa. The training work was authorized by the Pennsylvania State Department of Public Instruction as part of the vocational defense training program of the U. S. Office of Education. The details of the course were worked up by officials of the coal company and were approved by the authorizing agencies. The need for the training arose from the rapid expansion of the company's mechanized mining program which was instituted in 1939, so that by 1941 the lack of men properly trained in maintenance work imperiled the future of the program. The results of the training work justifies the effort and expense which the company has had to bear, and it offers an excellent example of what can be done to overcome a shortage of trained mechanics.

Men were selected on the basis of their physical fitness and the results of two aptitude tests, the Otis Mental Ability test and the Minnesota Paper Form Board test. The trainees were chosen from both mine employes lists and WPA lists. Two instructors were chosen from the maintenance force of the company on the basis of their formal education, ability, experience, and personality. Classes were held five days a week for 15 weeks, with the mine workers receiving four hours of instruction per day and the WPA selectees receiving eight hours of instruction per day. The mine workers were divided into two groups on the basis of the shift in which they worked, one section attending from 7 a. m. to 11 a. m. and the other section attending from 7 p. m. to 11 p. m. The WPA group attended from 11 a. m. to 7 p. m. One instructor taught from 7 a. m. to 3

p. m. and the second instructor handled the work from 3 p. m. to 11 p. m. This school, which was started in May, 1941, graduated 63 students in the first 15-week period and 58 in the second training period. The third group, which ended its work in May, had approximately 50 students that completed the work. These figures represent approximately 85 percent of each starting group.

The work for each day was divided into a class session and a shop session. In the class session the students were given instruction in mathematics and theory of electricity. In the shop session they learned to tear down and reassemble equipment, to test motors and motor controls for trouble, and to make the necessary repairs when trouble had been located. Studies which might be termed related subjects included a complete Bureau of Mines first-aid training course, a study of the construction and handling of flame safety lamps, and a study of that portion of Pennsylvania mining law which is related to the duties of mine electricians. In addition each group made two inspection trips, one to the Pittsburgh Testing Station of the U. S. Bureau of Mines, where demonstrations on testing of permissible equipment was witnessed; the other to a manufacturing plant where the students were shown the processes of making safety lamps, electric cap lamps, and electric lamp charging equipment. Demonstrations in the Snyder shop by a representative of the Bureau of Mines supplemented the visit to the Bureau's testing station.

The training program was financed by the State Department of Public Instruction through the local school board, this being the system of distributing vocational education funds for this type of work in Pennsylvania. The necessary equipment for the shop was furnished by the coal company, subject to being reclaimed when the need for it was over. The list of equipment in use is as follows:

Machinery—One mine locomotive; one shortwall mining machine; one electric coal drill; one shaker conveyor unit.

Motors—One shunt, one series, and one compound types of DC motors; one squirrel-cage, one slip-ring, and one single-phase types of AC motors; one motor-generator set.

Starters—One three-point and one four-point hand starters for DC motors; one automatic DC starter; one controller for the slip-ring motor; one starter for the squirrel-cage motor; one automatic AC starter.

Additional equipment — One power transformer; voltmeters; wattmeters; AC and DC ammeters; motor testing equipment; necessary tools.

Training Programs Can Follow Routine of Daily Job

Training programs of the type just described are extremely valuable in that they provide a large number of men who can, with very little additional training, become a part of the maintenance force of any coal company. This particular training program provided the company which sponsored it with sufficient new men to fill the many maintenance jobs which had been created by the large amount of equipment installed under their mechanization program. Similar training programs could, with very little adjustment, be introduced into areas where a number of companies are mining coal, and the men trained in this manner would be available to any of the companies. This, of course, would require cooperative sponsorship and management, but the results would more than justify the time and money spent on the training work.

Any training program which is designed to up-grade or give additional training along the line of their daily work to mine workers must recognize that each type of worker requires training emphasis on points peculiar to his particular job. For a mechanic the emphasis should be placed on both electrical and mechanical repairs and maintenance of equipment. For a machine operator a certain amount of training along mechanical and electrical lines is essential, but the emphasis should be placed on good operating practices as compared with bad practices, plus a discussion of hazards incidental to the operation of the machine. Bosses in mechanized sections of mines should be given the same type of training on machines as is given to the operators, and in addition they should be given a course on section management. It is sometimes difficult to decide where to stop the training of bosses and operators in the work on machines, for many of the men in these groups are just as much interested in the complete course given to the mechanics as are the men in the latter group. On the other hand, mechanics frequently enjoy taking the operator's course because it provides them with knowledge of the use and abuse of the equipment which they must repair. Frequently the decision on how much ground to cover for each group is decided by the men in the class instead of being made by the instructor.

U. S. STEEL CORPORATION

Care of a motor and a better understanding of its parts contribute to better maintenance

Recently the author had an opportunity to observe an up-grading training program in operation at the Monongah, W. Va., shop of the Consolidation Coal Company which emphasized the universal appeal of such training to men engaged in different types of mine work. The program, which is conducted as part of the regular extension program of West Virginia University, was designed to give training on certain types of mobile loading equipment. It could be, and probably will be, enlarged to cover other types of mine equipment as the demand for the work increases. The men to be trained were selected from interested applicants in the mines of the sponsoring company, and also from mines of other companies in the vicinity. The applicants were not limited to men on maintenance forces, for mechanics, bosses, and general laborers have taken the training work. The instructor, who is one of the maintenance officials of the sponsoring company, developed the course cooperatively with representatives of the university. The men meet each Saturday for a period of 10 weeks, each session consisting of one hour of classwork and three hours of shopwork. The class session is devoted to a discussion of troubles encountered by the trainees in their individual mines the previous week, and also to such theoretical studies as are necessary for an understanding of the work to be conducted in the shop. The class is then divided into small groups of two to five men, each group to work on a different maintenance problem for that particular shop session, but with every man working on every problem at some time during the training course.

Shop Force Available for Expert Instruction to Students

The sponsoring company has placed at the disposal of the class either an entire machine or parts of machines, such as controllers, hydraulic controls and operating cylinders, etc., so that each group can work undisturbed by the others. Certain of the regular maintenance force who are at work in the shop give expert instruction to the student groups on the construction and maintenance of the machinery in which they are specialists. Reports on the problems are required of each student, and grades for the students are based on these reports. This program, which was started in 1941, is designed to handle approximately 16 students in each class, so that in one year between 80 and 100 men could be trained without expanding the existing facilities or increasing the number of instructors. The value of such a program has been definitely proved by reports of a reduction in maintenance costs on the type of equipment studied which was in use at certain mines, and by outstanding production and maintenance records in sections of mines under the charge of bosses who took the training work. Undoubtedly this type of defense training work will increase as mining companies begin to appreciate its value, and the experience of this center will serve as a guide for the establishment of other centers throughout West Virginia.

Machine Operators Gain Experience in Shop

There is a practice in existence at a number of mines throughout the coal regions which should be cited as defense training, even though it is not sponsored by any state university or department of mines. This is the practice of taking machine operators and placing them for one month in the mine repair shop to make repairs on the same type of equipment as they normally operate. The intended result is to acquaint the operator with the construction of the machine and to educate him regarding the damage which results and the repairs which are necessary when the machine is abused in operation. Considerable good can result from this type of training, the amount of good depending on the receptiveness of the operator. The chief criticism of this type of training is the lack of theoretical discussions and the interchange of ideas found in training classes. If coal companies would recognize the value of including such additional training with shopwork practice, then more complete training of the operators and more satisfactory results would be obtained.

Still another type of up-grading training program is that offered to the mining industry of Pennsylvania by the Pennsylvania State College through its Division of Mineral Industries Extension. Basically it consists of three courses: a preparatory course of arithmetic; a machinery course, in which the machines used in mechanized mining at any particular mine are studied on the basis of their use, construction, operation, and maintenance; and an electrical course in which the motors and controls used on the mechanized mining equipment are studied on the basis of their theory, operation, and proper maintenance, together with methods of locating trouble should such occur. The preparatory course is given in two-hour class sessions at least twice a week, for six weeks. The machinery and electrical courses are given in one two-hour class session per week at which theory is discussed, and one three- or four-hour shop session per week during which the students tear down and reassemble machines, motors, or controls, and learn to make adjustments and minor repairs. A fourth course, termed a "supervision course," is contemplated but has not been placed in operation as yet; this is a course designed to impart some knowledge how to control the production, movement of machines, and personnel in a mechanized section of a coal mine, and it is intended primarily for the supervisory force.

This combination of training courses can be used to provide a mining company with any type of training program which they may desire. Most of the programs in the past have been of the long-range type, with bosses, mechanics, and operators or general laborers being grouped together for a study of all three courses in their regular order. Given in this manner, the training program becomes general in its up-grading effort, with all types of workmen receiving the same instruction regardless of their particular jobs. In order to keep all of the men in one group on about the same level as far as education or learning ability is concerned, the men who apply for training are given three aptitude tests to determine their mental ability, their mechanical comprehension, and their personality inventory, and the persons to be trained are selected on the basis of the test results.

Separate Classes for Bosses, Foremen and Mechanics

One variation of the long-range training program is to provide separate classes for bosses, operators, or mechanics. It was found that some operators were not interested in taking all of the machinery course when the work applied to machines other than that which they operated. Also, many of the operators were unwilling to take a complete course on electrical theory in order to understand how the motors and controllers on their particular machine worked. Mechanics were not too enthusiastic about taking shopwork on equipment which they

repaired daily, but most of them were quite eager to take a course on theory of motors and controls so as to understand the reason for many of the daily repairs which they had to make. Bosses were divided on their reactions to the machinery and electrical courses, some feeling that the knowledge gained was necessary for their daily work, others insisting that such knowledge was not so necessary and that what they needed was a course on how to manage their section. To meet such a variety of opinions the three basic courses are now used in the following manner:

If the primary reason for the training program is to reduce maintenance costs, then those persons who handle the mining equipment should be given training which will emphasize correct operation, proper lubrication, minor adjustments and repairs which can be made by the operator. A study should also be made of those bad operating practices which result in abuse and breakage and which should be avoided. If the results of such training are to be completely effective, then all of the machine operators in the mine must be trained, and this means that all operators should be admitted to the classes without any selection being made on the basis of aptitude test results. The persons who will be trained may or may not be given the work on arithmetic, depending on the opinion of the company officials as to its need. In the machinery course the entire group may be given work on all of the machines used in mechanized mining by the company. Information given to operators in this manner is translated almost immediately into better care of the machinery and a reduction in maintenance costs.

If the request for training is made because of any difficulty with bosses in carrying out the scheduled mining program, then a schedule of courses which will provide the needed training for such a group is arranged. The group should include all of the supervisory force of the mine. The program would start with the preparatory work on arithmetic, and it is surprising how much this type of instruction is needed by bosses for handling their every-day tasks. This group would then be given the machinery course with much the same type of instruction as was used with the operators. Bosses should know the equipment under their charge in order to properly direct equipment activities.

The final course for the bosses would be the one designated as the "supervision" course, in which production, machine, and personnel control is discussed. This latter course should deal with specific details instead of being general in its nature, and the intended result is to increase the efficiency of the bosses and provide a smoother production program.

It is possible that some or all of these basic training courses may be used in the near future to provide "spot" training of miners. For example, if a mining company finds that the placing of new men in charge of operating equipment is resulting in considerable abuse and a rising maintenance cost, it would be possible to give a short course on locomotives to haulage crews, or the crews in charge of cutting equipment could be given a short course in the operation and maintenance of the type of mining machine employed at that mine. These short courses on one type of equipment could be given in from two to six sessions of two to four hours each, depending on the construction of the machine being studied.

There have been approximately 600 men in mining towns throughout Pennsylvania who have received training under the various types of programs just described since the start of such work in 1939. As previously stated, most of the programs have been of the long-range type, but in the past six months there has been a growing demand for the abbreviated or "spot" types of training programs. Instructors for the work are selected from the engineering and operating staffs of the companies being served. The machinery and electrical courses especially require that the instructor be engaged in similar work in his daily tasks, so that master mechanics and chief electricians are usually placed in charge of these phases of the training work. The text material and the outlines used for any of the basic courses have been worked up cooperatively by the college and members of the operating and engineering staffs of mining companies in order to secure practical, up-to-date information for use in the classes. The persons who are trained usually pay a small fee for the text material supplied to them, but there is no tuition, and the sponsoring company supplies all equipment and materials necessary to carry on the program. The initiation of such training work requires close supervision by the college until the instructors grasp the proper teaching technique and the purpose behind the program.

An example of the manner in which a job training plan can be made effective is illustrated by the experience of a supervisor from a coal company in central Pennsylvania. At the request of his company he enrolled in the OPM (now WPB) training class at a near-by town. Along with the other class members, he was instructed in the fundamentals of job training, which in simple language consists of *telling*, *showing*, *illustrating*, and *questioning*. He learned to construct a "job breakdown" sheet on which were listed the key points of a job, such as "knacks," "hazards," "feel," "timing," and other special information. Practice before the class and criticism by the class members eliminated many of the teaching faults

A class of miners is receiving instruction on the assembly of an electric motor

which every beginner has. At the completion of the course he proceeded to train members of the supervisory force of his own company, and while the results were not comparable with those which the OPM instructor might have obtained, still a number of the men trained in the manner indicated their appreciation of the training and their intention of carrying out the principles imparted to them. In addition, this supervisor drew up a plan for job training of new machine runners by the company, a program which was very necessary to offset the gradual loss of machine operators through draft for armed service and through "drift" to other industries paying higher wages. This application of proper job training principles could be multiplied many times within the company whenever the need for training arises.

The author's knowledge of defense training programs for the coal mining industry is limited to such training as is being given in Pennsylvania and adjoining coal mining states. This review does not cover all of the programs in operation, for West Virginia University has conducted several programs which differ to some extent from that now in operation at Monongah, W. Va. One of these is a program conducted at a central shop located near Mount Hope, W. Va., which serves the mining companies in this area. The Maryland Bureau of Mines, which conducts vocational training for miners in that state, has also undertaken the establishment of a training program in mechanized mining subjects. Any of these training projects which serve to increase the efficiency of mine workers at this time must be considered as defense training through their aid to the coal mining industry.

The future of this much-needed type of training will depend on the attitude of the mining industry. Most of the programs in existence have passed through the development stage and could be expanded to provide training for thousands of miners if the need arises. This expansion, however, is contingent on the availability of men to supervise the work, and so far only a handful of men are acquainted with such work and have the experience to overcome the obstacles which arise every time a new program is started. The unsettled conditions within the industry have not contributed to the rapid development of the work; transportation difficulties have prevented many men from attending class and shop sessions for which they expressed a desire; working on cross shifts has also prevented many men from attending classes. In addition, the nature of the work is such that equipment must be made available, and this is not always possible when a mine is short of equipment and every machine must work three shifts each day. If the need for training is great, then some consideration must be given by mining companies to these problems.

In times of great emergency a nation will accept and develop ideas which would be passed over during the calmer peace-time period. Great needs are always productive of great ideas. The wave of defense training programs which has swept our country in the past year will leave an indelible impression on the minds of educators, and it is a foregone conclusion that future peace-time education will be influenced tremendously by the educational programs now being conducted. It is possible that present programs for training miners to continue their important defense jobs with the greatest efficiency will develop into a widespread vocational training plan to assist the mining industry, not only during the present emergency but also when the war is over and post-war troubles begin to plague the operator. Some or all of the training programs described in this article may provide the basic idea from which such a training plan will be developed.

MAINTAINING EXPLOSIONPROOF ELECTRICAL EQUIPMENT

By PHELAN McSHANE
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MANY instructions have been compiled on the proper maintenance for explosion resisting apparatus in order to insure safe operating conditions. Fortunately, however, there are certain fundamental rules which cover the important instructions and at the same time be easily understood and remembered. Equipment should be clean, parts kept tight that should be tight, and free moving parts kept free.

Aside from keeping the equipment clean, the maintenance schedule to be followed in the case of explosion resisting apparatus exactly that which would be followed in connection with non-explosion proof apparatus. The motors should be thoroughly blown out at regular intervals, the commutators kept in good condition, and the brushes free in the holders.

The control apparatus should be kept clean by an occasional wiping of all insulating surfaces between live parts. The contactors and relays should be maintained in first-class condition.

While explosion resisting apparatus is thoroughly enclosed, it cannot be hermetically sealed, and due to heating and cooling, air is drawn in and expelled from the enclosure. The air entering the controllers in spite of anything that can be done carries with it coal and other dust. In many instances the dust is conducting, particularly when moist, and for this reason all surfaces within the controllers across which electric leakage is likely to occur should be kept scrupulously clean.

It is realized that it is inconvenient to open up controllers and motors to thoroughly clean the equipment, but it is very much less trouble to do this occasionally than it is to perform major repairs which will certainly follow neglect.

Of interest to both the manufacturers and to those making use of the equipment is a publication of the Bureau of Mines which contains the requirements for explosion resisting apparatus and indicates the proper maintenance practices. (U. S. Bureau of Mines Information Circular No. 7185.)

TUNGSTEN

AN IMPORTANT WAR METAL

Interest in exploiting deposits for the war effort makes notes on tungsten ores more in demand both here and in Canada

By D. C. McLAREN
Toronto, Canada

IN the production of tungsten concentrates Asia leads by producing about 70 percent. Latin America is second with 10 percent and the remainder is produced in Europe, United States, Australia, Africa and Canada. In China the relatively high grade ore and an abundance of cheap labor admit of little competition. Most of the United States and Canadian deposits are erratic and low grade.

Consumption of tungsten in the United States increased by 42 percent in 1940 over 1939. Tungsten production is expected to rise sharply in 1942 and 1943, the extent of the rise depending largely on newly discovered deposits now being developed and on the reopening of old mines. It is interesting to note that increased activity in tungsten in South America also has followed the rise in price caused by war demands. Exports from the Argentine increased from 76,524 lb. in 1939, to 762,012 lb. in 1940. Bolivia jumped from 96,164 lb. to 1,208,595 lb., according to the Minerals Year Book, U. S. Bureau of Mines, 1941.

Due to increased modern mechanized warfare the metal tungsten is becoming increasingly important in the relative urgency of metals required to assist in American production of high grade, tough, alloy steels for armor plate, friction steels, and the like.

The following specifications were drawn up as to chemical analysis of high grade tungsten concentrates to be purchased by Metal Reserve Co.:

Scheelite Percent		Wolframite (Hubernite-Ferberite) Percent
60.00	WO_3	65.00
0.05	Cu	0.03
0.03	P	0.03
0.10	As	0.25
0.50	Bi	0.50
0.40	Mo	0.40
0.10	Sn	1.50
0.50	S	0.50
.10	Sb	0.50
1.00	Mn	...
.10	Pb	.10

Tungsten concentrates containing the stipulated minimum tungsten trioxide content but otherwise failing to meet the above specifications will be penalized according to the following deductions from the base price, all penalties to be assessed pro rata for amounts in excess of specifications allowable, and at the following rates:

	Penalty per short ton unit of WO_3
For each 0.01 percent of copper.....	10c
For each 0.01 percent of phosphorus...	10c
For each 0.10 percent of molybdenum..	10c
For each 0.10 percent of sulphur.....	10c
For each 0.10 percent of lead.....	10c
For each 0.10 percent of arsenic.....	10c
For each 0.10 percent of antimony.....	10c
For each 0.50 percent of bismuth.....	10c
For each 0.10 percent of tin.....	10c
For each 1.00 percent of manganese *..	10c

* Scheelite only.

The Metals Reserve Co. has announced that through 1943 it will pay $24 per unit of WO_3 in order to spur tungsten output.

The capacity of tungsten mills is not expressed by the number of tons per 24 hours, but by the amount of tungstic oxide (WO_3) produced. The standard used in marketing tungsten is usually the "unit," 1 percent of 1 ton, or 20 lb. An ore carrying 6 percent WO_3 is said to contain 6 units (120 lb. WO_3).

The ores of tungsten are not many in number, nor are they widely distributed in nature, but they are quite valuable, and ordinary deposits are generally mined with considerable profit.

The principal ores of tungsten are: Scheelite, $CaWO_4$; Wolframite, (Fe,Mn) WO_4 Ferberite, $FeWO_4$; and Hubernite, $MnWO_4$. There are also the following rare minerals of tungsten: Tungstenite, WS_2; Tungstite, WO_3; Cuprotungstite, $CuWO_4$; Powellite, $Ca(Mo,W)O_4$; Stolzite, $PbWO_4$; Raspite, $PbWO_4$; Chillagite, $3PbWO_4.PbMoO_4$; Reinite, $FeWO_4$; Ferritungstite, $Fe_2O_3.WO_3.6H_2O$.

Scheelite. This is one of the most important minerals of tungsten, derived its name from Scheele. (See MINING CONGRESS JOURNAL, April issue, p. 53.) It is formed under pneumatolytic conditions and is found in pegmatites or veins associated with the granitic rocks. Scheelite contains 80.6 percent WO_3 and has a specific gravity of 6.05, hardness 4.5 to 5.0. Due to its crystal structure it is brittle and tends to slime unless precautions are taken when crushing and grinding. Scheelite may be transparent to translucent, and the color may range from pale yellow, brown or gray; sometimes white, green, reddish or orange. The streak of the mineral is white, there is practically no cleavage, and an uneven fracture. Scheelite occurs in well formed pyramidal hemihedral tetragonal crystals.

Wolframite. This is another important mineral of tungsten. It has a submetallic lustre and its color may range from dark gray to black with a dark brown to black streak. It is quite brittle and opaque, and has a hardness of 7.2 to 7.5. Wolframite occurs in coarsely columnar or bladed aggregates with the cleavage prominent; also frequently in pseudo orthorhombic, monoclinic crystals which are usually bladed and vertically striated; sometimes coarse to fine granular. Often associated with tin ores.

Ferberite. This is a variety of wolframite, but contains little or no manganese.

Hubernite. Its lustre is submetallic or bronzelike to resinous, and its color may be brown or reddish brown, sometimes black. Thin fragments are often red by transmitted light. The streak is brown, and the cleavage is perfect clino-pinacoidal. It is brittle

and may be translucent to opaque. The specific gravity is 7.2 to 7.5, and occurs in radiating, bladed aggregates with a rough parting along the broad faces, readily yielding plates in this direction, this parting being more prominent than the cleavage. Pseudo orthorhombic monoclinic crystals are rare. It is often formed in quartz.

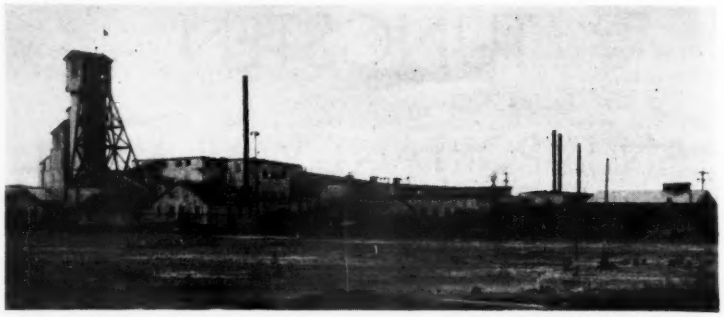
Tungsten ores are very widely distributed, but do not occur in large masses. Usually the ore is in pockets that are difficult and costly to mine. Both wolframite and scheelite occur in alluvial deposits, or in lodes at the junction of the granites and sedimentary rocks. Tungsten is widely distributed in the United States. The most important deposits occuring in Colorado, California, Nevada, and Idaho, with other smaller deposits occurring in South Dakota, Montana, Washington, and Arizona.

The chief deposits in Colorado are in Boulder County. The ore here is ferberite, and in width the veins vary from 2 to 4 feet. Fissure veins are found in the following locations in Boulder County: Between Boulder and Nederland, Gordon Gulch District, Beaver Creek District, and the Bummer Gulch District.

In California the most important deposit, which is scheelite ore, extends from near Atolia in San Bernardino County to near Rossbury in Kern County. Another area now is producing in Inyo County near Bishop, in Owen's Valley. In this area the complex ore occurs in a contact-metamorphic deposit, which is very unusual type for tungsten ore.

Some Gold Mines in Canada Have Tungsten Bearing Ores

In Canada scheelite occurs in Halifax County, Nova Scotia, as well as in northern Quebec and Ontario. The Nova Scotia scheelite is a honey yellow to pale reddish brown, coarsely crystalline, and shows distinct cleavage. Hubernite is found in Cape Breton and wolframite and scheelite in the Kootenay District of British Columbia. Canada is now entering into the production of tungsten, and several gold properties whose ore carries tungsten are making additions to their present mills to recover the tungsten content, among these is the Hollinger mines, which early this year announced the construction of a $50,000 plant for the recovery of scheelite from Hollinger ore. Little Long Lac mines, McKenzie Red Lake mines, Goodrock mines, Sullivan mines, Waverly Syndicate, Red Rose tungsten mine, all plan to erect tungsten concentrators in the immediate future.



ONTARIO DEPARTMENT OF MINES

Little Long Lac Gold Mines, Ltd., in Canada, is becoming interested in the recovery of tungsten from its gold ore

The concentration of tungsten ores does not present any unusual features in practice. The minerals of tungsten are all of high specific gravity and do not usually occur with other metallic minerals, and are as a rule easy of separation; they are all friable, but unless finely crystallized and disseminated through the gangue yield a high extraction with jigs and coarse sand tables; crushing by rolls is the best practice for this type of ore.

Some of the deposits contain the mineral disseminated through the gangue in small crystals, in which case crushing by ball mills, classification and treatment on sand tables and flotation is the most modern practice. Stamps are used in some parts of the world, but this practice is due in a large part to the existence of idle mills near by which were originally designed for other ores. The adoption of these existing plants and machinery has led to some confusion as to the best practice, and while these plants were the means of an immediate production with a small outlay, they must not be taken as an index of practice for new plants.

In general the grade of concentrate produced may be considered according to the requirements of the three main uses to which they are to be put: (1) ferrotungsten, (2) metallic tungsten, (3) tungstic oxide. As a rule a general standard is that concentrates should contain at least 60 percent tungstic oxide, WO_3.

By hand sorting a small amount of 60 percent ore may be obtained, but rarely is a product of better than 50 percent made. Hand sorting does not pay as a rule, as the greater part of the ore remains to be crushed and concentrated.

Rolls have been used from primary crushing and with secondary rolls or ball mills for the secondary stage. Rolls give less sliming than ball mills, but it is found that they do not liberate all the mineral, as the ore can not be sufficiently reduced. Sliming in ball mills is cut to a minimum by using mills with a large diameter and short length. An excess amount of water is used to facilitate rapid passage of the ore through the mill.

Ore Particles Should be Liberated with Minimum of Sliming

Grinding is important as most tungsten ores are very brittle and slime readily, and the great problem of milling these ores is the effective handling of the slimes produced and crushing so as to liberate the ore particles with a minimum of sliming. An adjustment of the concentrating machine to produce a high-grade product results in a lower recovery, whereas attempts at high recovery result in a comparative low-grade product. This fact must be kept in mind when recoveries are considered; both the recovery and the grade of product made should be known. A mill reporting a recovery of 75 percent may seem to be doing poorer work than another reporting 90 percent, but the first mill may be producing a concentrate of so much higher grade that comparatively it is doing excellent work.

The ball mill product is classified and the oversize returned to the mill. This has proved to be the most satisfactory grinding method and is now used almost entirely. Jaw crushers or gyratory crushers are used for primary crushing, rolls for secondary, and ball mills for grinding.

Classifiers are very important at all stages to avoid needless crushing and grinding, thus thereby prevent excess sliming and excessive costs. Slimes are now treated by flotation, but coarse sands are treated in jigs, which

give a high-grade concentrate and occupy a minimum of floor space. The fine sands are treated on vibrating tables and usually complimented by the reground hutch product from the jigs. Slimes at one time were treated on slime tables, vanners and stationary canvas tables, however they are now almost universally treated by flotation. The successful operation of these various concentrating devices is dependent upon the proper use of classifiers and the proper separation of the various products.

Classification is also important in the grinding circuit. The ore is sent through ball mills with a large ratio of water to minimize sliming. This means that coarse particles will pass through the mill without being ground sufficiently fine to liberate all the tungsten minerals. The oversize particles must be separated from the fines and returned to the mill for regrinding. This is best accomplished by the use of classifiers in closed circuit with the grinding mills. Both bowl and rake classifiers as well as hydroseparators and hydroclassifiers are used with much success.

Jigs are most effective on the coarser sized particles. The Hartz-type jig is used a great deal. Three products result: A concentrate, hutch product, and a tailing. The hutch product is reground and treated on tables. The tails are usually clean enough to discard. The Denver mineral jig is becoming increasingly popular for tungsten recovery as it does not cause excess circuit dilution and possesses certain other advantages.

Vibrating Tables Used with Success

There are various types of vibrating tables which have been used in treating fine sands. The more common are the Deister, Wilfley, and Deister-Overstrom tables which have been used with great success. In order to obtain maximum recovery it has been found advisable to recover the garnet with the tungsten minerals, when it is present, and clean the concentrate at a later stage with magnetic separators. Care must be taken not to overload the tables or recovery will be affected. It is advisable to use only one type of table in one mill, as standardization leads to lower costs. A concentrate, middling and tailing are usually produced. The concentrate as a rule is clean enough for sacking, unless garnet, cassiterite, epidote and pyrite are present. If these are present, additional treatment of the concentrate is necessary. Middling product is treated on following tables or retreated on the same table. Tailings at one time were discarded, but tendency now is to treat them by flotation.

Monell tables, Frue vanners and canvas tables have all been used in the past for slime treatment. The most popular were canvas tables; these gave only a 15 to 35 percent WO_3 concentrate. Slimes today are treated almost entirely by flotation. The recovery, however, is still only fair and still remains a problem in tungsten metallurgy.

Grinding with an excess of water necessitates dewatering apparatus. Thickeners and other mechanical types of dewaterers are used. In the arid regions dewatering is essential in order to minimize water losses, as water must be reused.

Magnetic Separators Produce Refinements in Recovery

The presence of garnet and epidote in the contact metamorphic deposits necessitates magnetic separation methods. It is difficult to separate the tungsten minerals from the garnet and epidote by gravity methods without sacrificing recovery. These minerals can be separated by magnetic fields from tungsten minerals, a low-grade concentrate could then be taken in order to obtain a high recovery, and an additional treatment introduced. Wetherill and Dings magnetic separators have proven very satisfactory. Garnet, being magnetic, is removed on cross belts and discarded. Sometimes the garnet has a market value as an abrasive. In this manner a concentrate assaying over 60 percent WO_3 is easily made.

Pyrite and various other metallic sulphides are as a rule found in gravity concentrates. As the sulphur content must be kept at a maximum of 0.50 percent, the sulphur must be expelled. Pyrite is not magnetic; but after a short roast a magnetic film is formed around the pyrite particle, which can then be removed by magnetic separation. A complete roast is unnecessary as the thin film can be formed around a core of pyrite after a short roast. There are three factors governing roasting: (1) Particle size, (2) temperature, (3) duration of roast. The greater the particle size, the longer the duration of roast. The temperature must be equal to the ignition temperature of the pyrite, and be continued till a film is formed.

A satisfactory roast may be identified by the absence of typical pyrite particles and by a flat, dead color ranging from bronze to black. In some cases it may be advisable to give a dead roast following magnetic separation in order to remove the remaining sulphur.

The chief development of importance in the tungsten industry in the past six years is the tendency toward flotation in the concentration of ores. As a large portion of our tungsten production is from the contact metamorphic occurrences of scheelite, which type of ore gives a very low recovery by ordinary gravity methods, but a good grade flotation concentrate can be obtained from scheelite occurring in quartz veins.

Fatty acids or fatty acid soaps, such as oleic acid or sodium oleate with an alkaline reagent (e. g., caustic soda, soda ash, sodium silicate), give a satisfactory separation of scheelite from quartz.

The oleic compounds form a film of calcium oleate around the scheelite particle, and the sodium silicate depresses the quartz. Formic acid, hydrochloric acid, nitric acid, sulphuric and sulphurous acids, as well as the short chain organic acids, will depress apatite. It must be noted that the water must be softened prior to flotation, or excess reagent consumption and transportation of the gangue into the concentrate will result. A good water softener is sodium carbonate plus a small quantity of sodium silicate, as this combination does not affect the flotation of scheelite. In cold climates lime must be added to aid in settling the slimes, as they tend to flocculate at low temperatures.

Various Reagents Contribute to Flotation of Scheelite

In the complex ores the metallic sulphides are floated first as a rule, as the sulphide depressants affect the flotation of the scheelite. The sulphides are floated by the use of the common reagents used for this purpose. The scheelite may then be floated by adding oleic acid, sodium oleate, and a small quantity of sodium silicate. This rougher froth is then cleaned with sodium silicate reagent to depress the quartz and mica. In the final cleaning lactic acid and formic acids are added to depress the remaining traces of mica and apatite, alkaline circuits are necessary when it is present.

Hubernite, wolframite and ferberite may all be floated, but not so easily as scheelite. Oleic acid and sodium oleate are used as activators, with caustic soda, soda ash and sodium

silicate as silica depressors. An acid circuit is desirable when treating ferberite. Ferberite is less sensitive to depression by acid if a metal salt, such as manganese sulphate is present. Acidified dichromates are quite effective in giving clean flotation of ferberite with depression of apatite and fluorite.

Wolframite and scheelite can be readily separated by flotation. This is not required unless another element which can not be depressed (e.g., fluorite), is present. The wolframite would then be separated from a scheelite-fluorite product. The scheelite is next separated from the fluorite.

Recently much experimentation has been carried out on the flotation of scheelite using orso and emulsol X-1 and cresylic acid as reagents. The Orso is added as a 2.5 percent solution at the rate of 0.2 pounds per ton. The Emulsol at the rate of 0.02 pounds per ton. Cresylic acid is used to stiffen the froth, it is very quick acting, and gives a deep froth, it is advisable to add it at the head of the cell and progressively through the flotation unit. The grade and recovery is dependent on sodium silicate which is added as a 10 percent solution in the ball mill.

The concentrate loss in treating tungsten ores is due almost entirely to the difficulty in treating slimes. As the tungsten minerals are so much more brittle than the accompanying gangue that in crushing and grinding it is reduced to particles much smaller than the gangue particles, and although its specific gravity is much higher, it is acted upon by the same forces and in the same manner as is the gangue.

The slime losses may readily amount to 20 to 30 percent of the tungsten content of the original ore.

Tungsten minerals fluoresce under the ultraviolet light. This fluorescence ranges from a white to a pale blue to a dark blue depending upon its impurities.

It has been suggested that hand sorting could be conducted under the ultraviolet light, but there are two distinct disadvantages to this suggestion: 1. The ore mined is of such a low grade, and so little gangue is mined, that there is little material which can be discarded that will materially raise the tenor of the ore. 2. The harmful effect ultraviolet light has on the sorter's eyes and skin.

By the use of ultraviolet light, if carefully conducted, the degree of initial crushing prior to concentration may be ascertained. On some ores the mineral will begin to liberate itself from the gangue at 0.5 in. and coarser, whereas on others, reduction may have to be 10 mesh or finer.

Ultraviolet light is also used in making a rough assay of an ore or concentrate. The material to be tested is taken in a dark room and exposed to the ultraviolet light, and compared with a series of standards, the standard which most closely resembles the sample gives the percentage WO_3 present.

Milling Methods Vary Depending on the Type of Tungsten Ore

It is very difficult to select a flow sheet that is typical of any district, as there are wide variations in the ores, and methods of treatment.

Flow sheet 1, is for an ore that is predominantly quartz with minor amounts of fluorite, CaF_2; rhodochrosite, $MnCO_3$; muscovite; and pyrite forming the gangue minerals. Hubernite, tetrahedrite, scheelite, galena, sphalerite, chalcopyrite, and molybdenite comprise the ore minerals.

The flow sheet as shown here treats 100 tons a day and operates as follows: The ore is fed to a 9 x 15-in. Blake type primary crusher set to a maximum of 1 in. and then goes to the ore bin. From here the feed is passed over a 2 x 4-ft. vibrating screen whose oversize goes to a ball mill, the undersize going to a 16 x 24-in. Denver jig. Jig tails also go to the ball mill, and the hutch product (which is approximately 20 to 30 percent WO_3), goes to a surge bin and then to the roaster.

The ball mill is a Marcy with compensating grates graduated from three-eighths to one-half-in. Ball mill discharge passes through a one-fourth-in. mesh spiral screen classifier whose oversize returns to the ball mill and whose undersize is split fed to two Denver jigs. Jig tails go to a 54-in. by 14-ft. Dorr rake classifier, while jig hutch product joins the previous jig product, feeds to surge bin, hence to roaster.

The classifier sands return to the ball mill for additional grinding while the overflow is pumped to a 6 x 6-ft. conditioner and then to a number 250 Denver unit flotation cell and a 6-cell 32 by 32 Denver "sub A" flotation machine. Feed goes to the third cell of the six. The concentrates from the last four cells return to No. 1 cell, and final concentrate (which is silver, copper, lead, zinc and molybde-

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Another of Canada's outstanding gold producers, Hollinger Gold Mine, Ltd., is preparing to recover tungsten from its gold ores

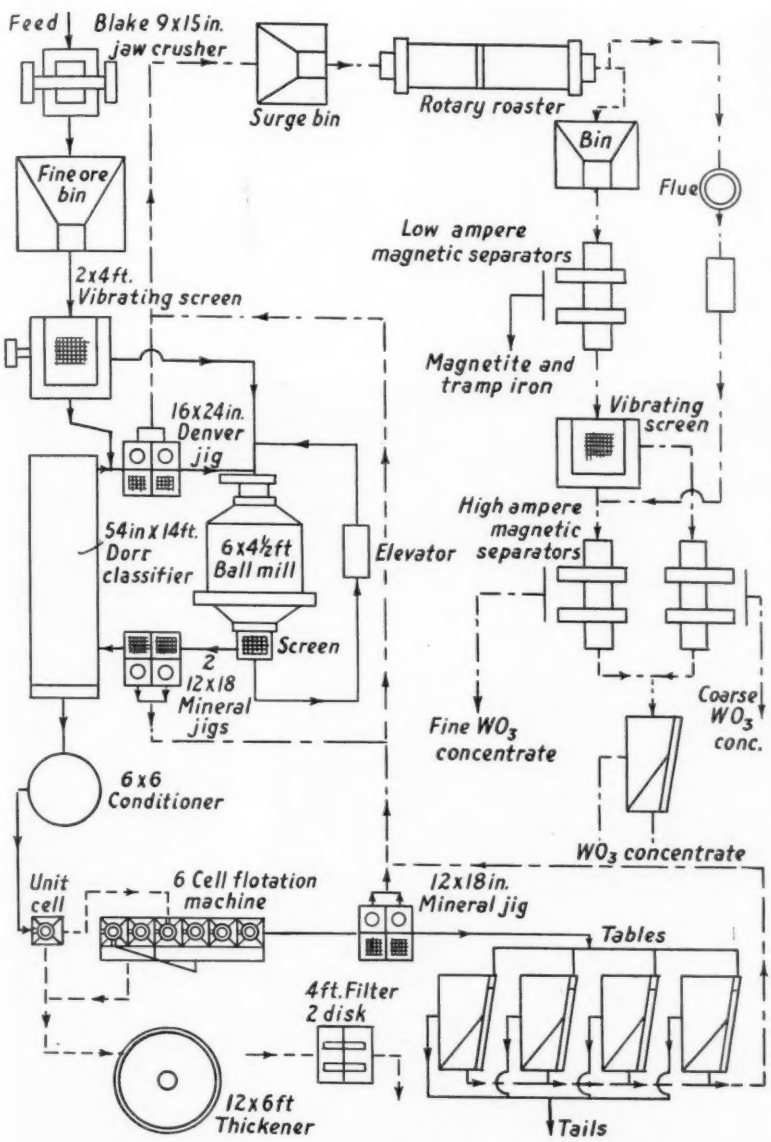

Fig. 1. Flow sheet of a tungsten recovery plant employing roasting and low and high amperage magnetic separation

num) goes to a 4-ft. 2-disk filter and then to the smelter.

Tails from the flotation machine pass over a 12 by 18 Denver jig which discharges to five Plat-O tables. This jig hutch product with the table product goes to same surge bin as previous jig concentrates and then to roaster. Table tails are sent to the tailing dam.

The surge bin contents are fed to the roaster with a scoop and discharged on cement floor for cooling. A dust collector collects 600 to 800 lbs. of high-grade tungsten flue dust per month. The cool roast is fed from another bin to a Dings magnetic separator operating at 4 to 5 amperes. Roasted pyrite and tramp iron are removed here, the remainder passes over a vibrating screen, split into a coarse and fine product, each of which passes over a 17 to 20-ampere Wetherill magnetic separator. The gangue material passes over a scavenger Plat-O table from which a slight recovery is made of sulphides and tungsten, and a cut returned to the surge bin.

The tungsten concentrate, which contains between 66 to 70 percent WO_3 is bagged in double two-way stretch paper-lined burlap bags, 100 lbs. to a bag for shipment. Recovery in this flow sheet is approximately 65 percent. The ratio of recovery of tungsten approximates 87 percent by Denver jigs, and 13 percent by tables.

Flow sheet 2, is for an ore containing gold, silver, antimony and tungsten. The mineralization of the ore body is primarily pyrite and mispickle disseminated through more or less altered granodiorite-aplite country rock. The antimony is found disseminated through the gold ore and in high-grade stringers. Scheelite occurs in fissures which appear to have been opened at a later date than the pyrite disposition. Antimony was of a later date than the scheelite, as antimony can be found in fractures in the scheelite.

This flow sheet handles 115 tons per day and operates as follows: The ore is fed from the feed bin to a pan feeder to a 4 x 8-ft. bar grizzly with 3-in. openings, the oversize goes to a 24 x 36-in. Blake type jaw crusher and then joins the grizzly undersize on a 30-in. conveyor belt. This is discharged on to a 3 x 6-ft. vibrating screen, with 2 x 4-in. slot openings. The oversize is fed to a No. 5 Gates crusher, and together with the screen undersize travels via a 18-in.-wide belt conveyor to a 4-ft., 6-in. x 5-ft. vibrating screen. The oversize is crushed in a 3-ft. Symons crusher, and joins the screen undersize on a 20-in. belt conveyor, from where it is discharged into a 250-ton bin.

The ore from this bin is fed by a pan feeder to a 7 x 36-in. Hardinge ball mill in closed circuit with an Atkins spiral classifier. The classifier overflow is conditioned and fed to 8 Kraut cells, the heads of which go to 4 Kraut cleaners whose tails are returned to the first cell battery for retreatment. The 8 Kraut cell tails go to 10 Denver cells, whose tails are pumped to 6 rougher cells, these tails go to waste. Heads go to a battery of Pan-American cells, whose tails go to waste, and head to a 6 x 24-ft. thickener, the underflow of which is filtered in a 6 x 5-ft. Oliver filter, and hence to storage.

Sixty to sixty-five percent of tungsten ores are used in the manufacture of ferrotungsten, which contains about 80 percent tungsten. This is added to steels, the remainder is used in making tungsten metal, tungsten carbide, and tungsten chemicals. Tungsten carbide is used for making tips of cutting tools and dies.

COAL MINE BUMPS—II

When planning a mining system consideration should be given to a method that will keep rock stress as low as possible.

By CHARLES T. HOLLAND
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This is the concluding part of the author's summary of data on the phenomena of coal mine bumps. Reference to data mentioned in Part I, is occasioned by the author's necessity to explain some bump occurrences illustrated in this article.

DUE to the presence of joint and other planes of weaknesses in the strata forming mine roofs and also to their very low tensile strength, the flat arch structure probably offers the more likely explanation of the shock bump. It should be noted that in so far as the action on the pillar is concerned, the failure of both the beam and flat arch would cause essentially the same effects. A bump of this nature will frequently occur back from the actual pillar line as shown in (Fig. 3). Under conditions such

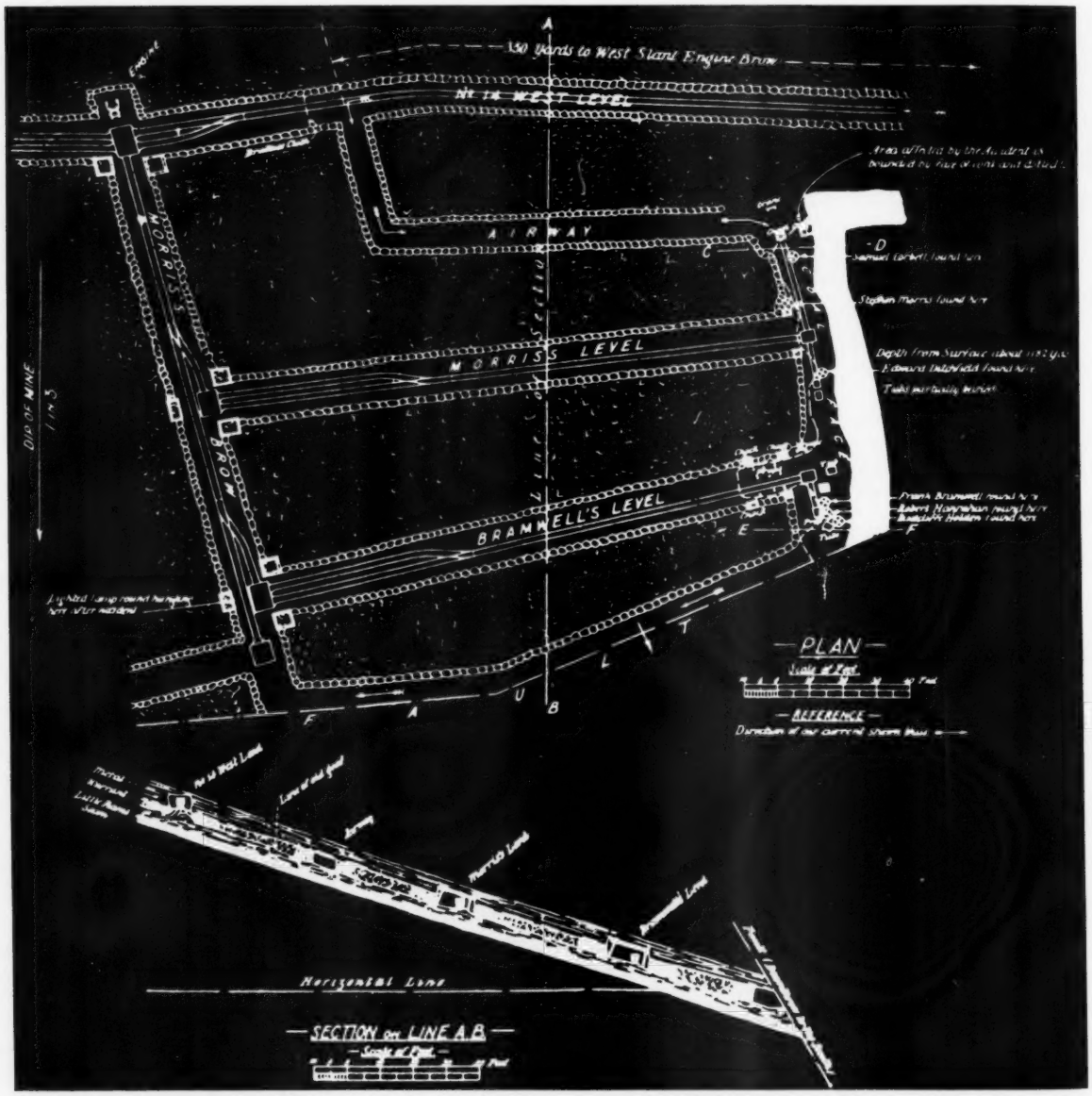


Fig. 7. This bump occurred at Pendleton Colliery. Note, the mining system is longwall using packwalls. This bump actually consisted of an upthrow of the floor. However, coal is also thrown from the face with considerable violence. The presence of the faults may have been a contributing cause. However, shocks from other causes are not ruled out. (After, Committee, Colliery Guardian (1927) Vol. 135. P. 533.)

as these, work at the wall face is comparatively safe, although in the case of the inverted arch it would seem that bumps may occasionally occur at the wall face or pillar line unless all the elastic resistance had been squeezed out of the pillar.

Shock bumps may also be caused by overlying strata falling through a void created by subsidence and thereby striking a heavy blow. This blow may be transmitted over considerable distance, causing bumps where the pillar strength is not great enough to withstand it. The cause of a bump in the Coal Creek Mines was attributed by Rice[16] to a blow originating in this manner.

It is frequently stated that a strong coal is one of the necessary conditions for the occurrence of bumps. However, the strength of coal is not easy to determine and frequently it is hard to estimate. Therefore, comparison between beds are hard to make. Furthermore, the strength of coal developed in a pillar is influenced by the pillar dimensions; the strength increasing as the ratio indicated herewith increases.

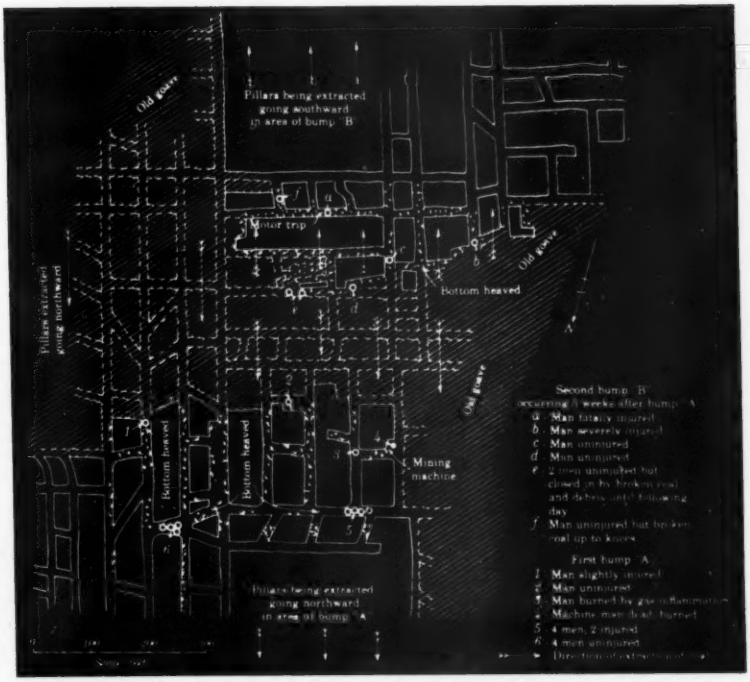


Fig. 8. This bump occurred in a mine working the Taggart bed under a cover of about 2,000 feet. The first bump A may have been either a pressure or a shock bump. Bump B was probably a shock bump. (After, Rice, United States Bureau of Mines, R. I. 3267)

Lateral Dimensions of Pillar

Thickness of Pillar

For this reason a coal which appears weak and even tests weak may develop great strength in compression when in a mine pillar. The Pocahontas No. 4 bed of southern West Virginia is evidently of this class, because if tested as a 3-in. cube it would probably not develop a compressive strength in excess of 1,800 lbs. per sq. in. A 3-in. cube of Harlan coal taken from a mine in Kentucky[17] in which bumps have occurred failed in compression when the load was raised to 4,130 lbs. per sq. in. A similar specimen from the No. 2 bed of Springhill, Nova Scotia,[18] developed a strength of 2,760 lbs. per sq. in. The Harlan coal would be classed as a fairly strong coal, but some coals develop strengths in compression of close to 7,000 lbs. per sq. in.,[19] and, of course, in comparison with coals of this strength the coals described above would be classed as weak.

Tests of coal from many beds and rock specimens from the roof and floor indicate that they all are highly elastic when subjected to stresses of short duration. To illustrate the elasticity of these rocks the stress strain curves (Fig. 4) are given. Notice that the coal from the Springhill and Harlan beds show high elasticity and even when the stress is carried close to failure, little permanent set was produced in the specimen. The curve showing the Pocahontas No. 3 coal indicates a larger permanent set, but this is to be expected because the coal is much softer and more porous than the other two specimens. The curves for the sandrock and shale specimens (see Fig. 5) are typical of what is to be expected in the way of elastic properties of these rocks. Since coal and coal-bearing rocks are highly elastic, it is possible for them to transmit

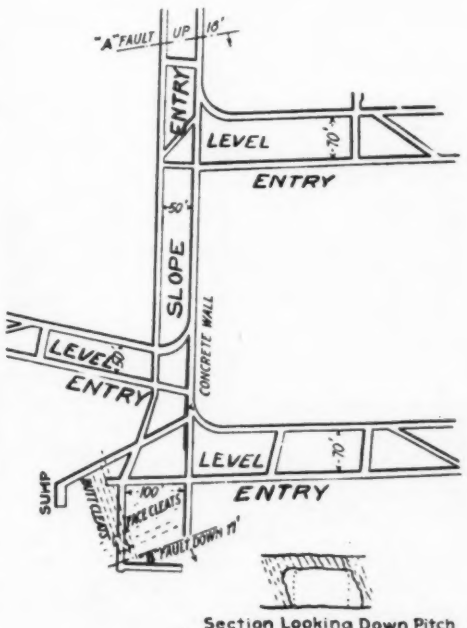


Fig. 9. A bump which happened in Carbon County, Utah. The bumps occurred only in the slope entry, the level entries being free of them. Stresses induced when the faults were formed were supposed to have been the cause. Cover varied between 1,100 and 1,800 feet. (After, A. C. Watts, COAL AGE, Vol. 14, p. 1028)

Section Looking Down Pitch
(Showing Inclination of Butt Cleavages)

[16] Annual Report of Minister of Mines, British Columbia (1917), p. 328.
[17] Sample furnished by J. F. Bryson.
[18] Sample, furnished by T. L. McCall.
[19] C. E. Lawall and C. T. Holland, Some Physical Characteristics of West Virginia Coal, Research Bulletin 17—West Virginia University, Engineering Experiment Station.

TABLE IV
PROPERTIES OF COAL MEASURE ROCK

Specimen	Dimensions	Ultimate Strength Lbs. Per Sq. In.	ENERGY STORED PER CUBIC INCH OF SPECIMEN INCH LBS. ½ Ultimate Strength	Ultimate Strength
Sandstone	2¼" Diam. 11" Long	11280	5.6	18.3
White fine grain sandstone with pebbles of slate	2 7/32" Diam. 4¼" Long	6360	3.8	9.3
Gray curly shale (sandy)	2¼" Diam. 8" Long	8060	2.5	8.2
Banded gray shale (sandy)	2¼" Diam. 2¼" Long	7.750	4.0	11.0

stress waves over considerable distances before the waves are damped out. The elasticity of these rocks also make it possible for them to store comparatively large amounts of energy. Part of this energy is released when the rocks fail because of overstress. The curves (Fig. 6) give an idea of the energy coal stores when tested in compression in the laboratory with four sides free to expand. The figures[20] in Table IV give some idea of what is to be expected from sandstones and shales in the way of compressive strength and storage of energy. It seems reasonable to believe that this stored energy may be a source of part of the energy which causes the destructive effects of bumps.

The stress developed in any given area in a coal pillar will be determined to a considerable extent by the action of the roof and floor and the elastic properties of the coal itself. Areas in a pillar having a higher elastic constant than the surrounding coal will develop higher stresses and hence may fail abruptly if a free face is available. This fact will have a bearing on the occurrence of pressure bumps and, of course, will be active in the case of shock bumps. Differences in the strength and elastic properties of the various benches that make up the coal bed can also probably act to lower the strength of the pillar and, therefore, become a factor in the mechanics of bumps. By consulting the bed section presented (Fig. 1) it can be seen that in many cases the difference in member hardness and, therefore, presumably in strength and elasticity was sufficiently great to be noticeable by ordinary examination.

[20] Charles T. Holland, The Physical Properties of Coal and Associated Rock as Related to Causes of Bumps in Coal Mines. A. I. M. E.—T. P. 1406, p. 12.

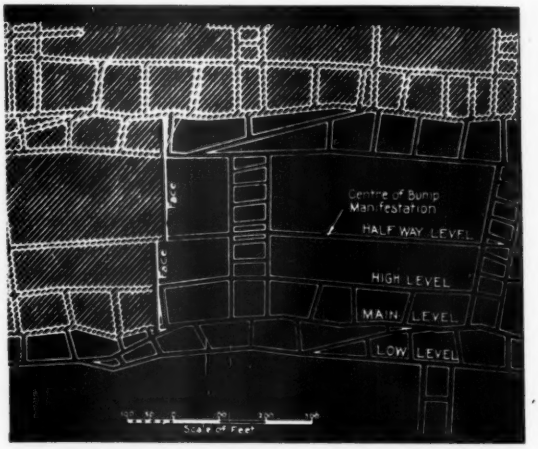


Fig. 10. Conditions under which bumps frequently occur in Springhill No. 2, Springhill, Nova Scotia. The mining system was changed to retreating longwall from room and pillar in the attempt to eliminate bumps. However, they have continued to occur. (After, McCall, A.I.M.E., Vol. 108, p. 56)

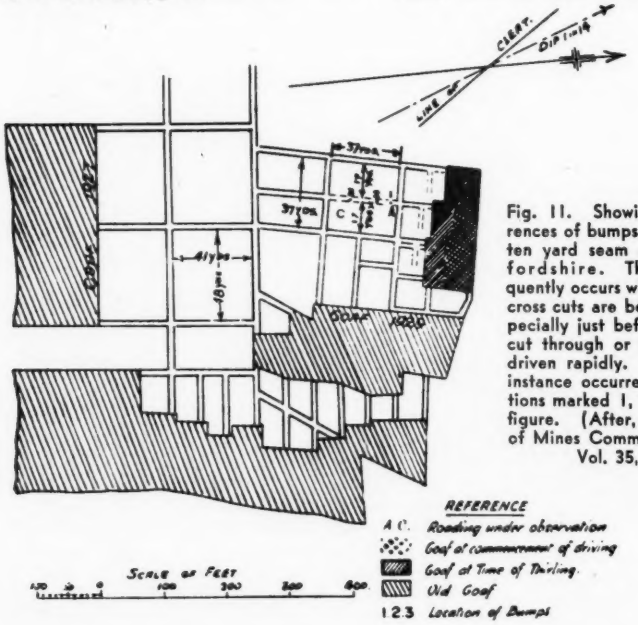


Fig. 11. Showing the occurrences of bumps in the thick or ten yard seam of South Staffordshire. The bump frequently occurs while entries and cross cuts are being driven, especially just before the entries cut through or when they are driven rapidly. Bumps in this instance occurred at the locations marked 1, 2 and 3 in the figure. (After, Safe Working of Mines Committee, A.I.M.E., Vol. 35, p. 125)

Mining methods are also factors of great importance in the causes of bumps. Some practices of mining which have been associated with bumps are: (1) Too much coal removed in advance mining; (2) the pillars left are not of uniform size; (3) irregular withdrawal of pillars leaving points projecting from the pillar lines or leaving pillars in the gob; (4) the pillar lines in different sections moving in opposite direction passing each other; (5) pillar lines starting in the same general locality and then advancing in opposite directions. The mining methods shown in (Figs. 7 to 12) indicate typical conditions under which bumps have occurred. It should be noted in some cases that no fault can be successfully pointed out in the mining methods and in at least one case the mining method has been altered to prevent the occurrence of these sudden pillar failures without complete success. The advancing longwall system of mining using heavy pack wall, although frequently used under heavy cover apparently has been comparatively free of bumps,[21] but they have been known to occur in the presence of faults even when advancing long-

[21] Crumps at the Pendleton Colliery. Colliery Guardian (1927), p. 533.

wall is used. It is probably correct to say that no system of mining will prevent the occurrence of bumps under all circumstances, but the mining system can be designed to prevent them in some cases and in other cases to diminish the severity and mitigate the effect of such bumps as do occur.

When mining under heavy cover in which strong elastic strata occur, the mining system should be designed to: (1) Keep the unit load on the pillars as low as possible. This requirement suggests that as little coal as possible be taken out in the advance workings. Because of their increased resistance to sudden failure and because they cut down the free or open face in which bumps can occur, the pillar formed by the advance workings should be as large as practicable. Uniformity in the size of pillars should be striven for as many small pillars around or in proximity to a large pillar will probably act to increase the unit load on the large pillar beyond a safe value and may cause bumps when the attempt is made to remove it. Points projecting into the mined area or isolated pillars should be avoided on pillar lines. (2) Steps should be taken to prevent kicks from arch or beam failure of the roof members. In advancing longwall, this is accomplished by building heavy pack walls which tend to limit sharp bends in the roof and to diminish the amplitude of subsidence, thus tending to prevent failure of the roof beds in compression. In the case of retreating longwall or long regular pillar lines in room and pillar mining the same general effect can be obtained by building rock-filled cribs in the mined area. This method has been tried with considerable success in the Harlan field of Kentucky.[22] (See Fig. 13.)

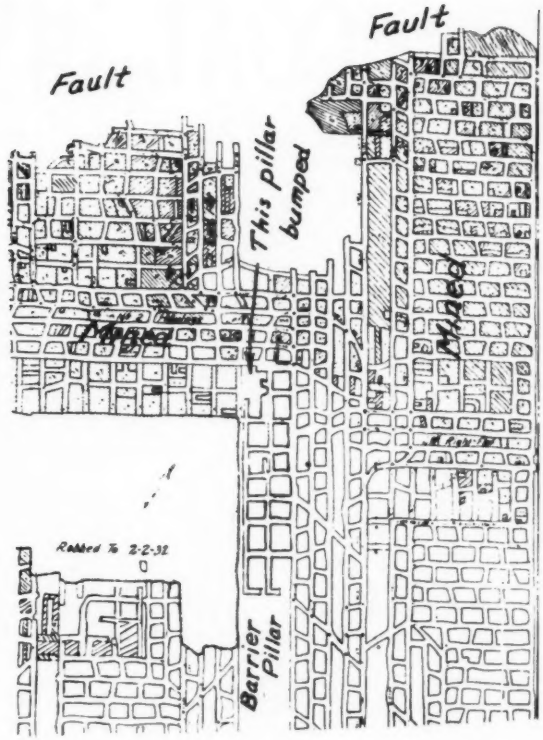


Fig. 12. Conditions under which a bump occurred in the Pocahontas No. 4 bed in McDowell County, West Virginia. The area described as a fault is actually a coal "want" or "washout"

The mining system, however, can hardly be expected to prevent bumps which are caused by stresses produced in the rock of the roof and floor, and the coal bed by the formation of faults, folds, wants and other disturbances of a similar nature. However, the mining system can act to accentuate or diminish the effects of these stresses. Therefore, a mining system carefully designed to keep stresses induced by mining to values as low as possible, will reduce the possibility of the combined geologic and induced mining stress from becoming sufficiently intense to cause violent failures.

In conclusion it should be stated that our knowledge concerning the cause and the circumstances affecting the occurrence of bumps is in many aspects incomplete. It is only fair to state that the theories advanced as explaining them are incomplete and are rather inadequate and unsatisfactory. Many of the questions can only be answered by obtaining more information about actual occurrences. Therefore, when a pillar, roof or floor failure of this nature occurs, all the information possible should be recorded and if possible made available to the mining profession. Certainly as the more general mining of deep lying beds occurs, pressure effects of this kind are likely to become more common unless they are better understood and effective steps taken to prevent them.

[22] J. F. Bryson, Further Developments in Preventing Bumps in Harlan County Coal Mines. A. I. M. E. Contribution No. 107, p. 4.

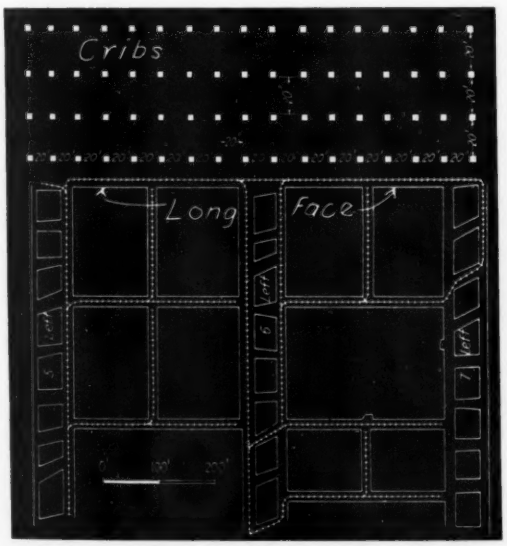


Fig. 13. Illustrating the use of cribs for preventing bumps when mining by using a retreating long-face. Note the size of the pillars. (After, Bryson, A.I.M.E. Contribution No. 107, p. 4)

With the COAL DIVISION

of the AMERICAN MINING CONGRESS

MAN POWER SHORTAGE—A NEW EXPERIENCE IN COAL MINING

By G. B. SOUTHWARD
Mechanization Engineer
American Mining Congress

FOR the first time in the lives of most of us there is a real shortage of coal miners; usually it has been the other way around and, after many years of trying to spread employment and "share the work," we find it rather difficult to go into reverse. Because of the newness of this problem, there is little precedent to use as a guide and certainly there are no answers in the back of the book, but a brief summary of opinions expressed by ,coal operators in different fields may suggest some measures that can alleviate the situation.

There are four major factors which are causing the shortage of man power in the coal industry, (1) enlistments or induction into the armed services, (2) transferring to war industries, (3) absenteeism, and (4) changing from one company to another. The following paragraphs will consider each of these in order.

Selective Service Draft

Enlistments and the draft which accompanied the raising of our first army of one and a half million men did not take enough coal miners to create a serious employe shortage but, looking into the future, an army of four or five million would, by direct proportion, multiply the man power loss by three, and this effect would be very materially felt. Occupational deferment, however, is now authorized for key men in essential mining employment classifications and, since an increased coal production is necessary for the war program, we have reason to expect that local draft boards will cooperate with the mines in their communities.

Defense Industries

The transferring of coal employes to defense industries may have passed its peak but in any case this is something that is hard to combat. Most miners are patriotic Americans and if they cannot carry a gun they at least want to help make the gun or its ammunition. They do not visualize the transition of coal into powder, tanks, or aircrafts, and in staying on their jobs many of them feel that they are not in the war picture. As one operator expressed the situation, "Our men have been mining coal for a long time—it's an old story to them—and consequently they are inclined to regard mining as a peace-time rather than a war-time occupation." Since patriotism is the motive that activates this type of man, patriotism should be the basis of the appeal for him to stay on the job; posters and bulletins showing the direct relation of coal to munitions, public addresses in mining communities, and private talks to individuals by the company officials would all help to bring home the idea to the miners that the best service they can perform for their country is to produce coal.

Absenteeism

Absenteeism is mainly attributed to the traditional belief of a coal miner that he has the inherited right to work if, as, and when he pleases. In hand loading the absence of one man simply subtracts his own individual output from the day's production, but in mechanical operations the loss of a man from a crew reduces the tonnage of an entire loading unit. Absenteeism if allowed to increase will affect the production of coal, and it appears to be the general opinion that the best method of correction is through appeals to the individual by the company officials and by the other workmen. Since all men are different, each man requires a separate approach and again it seems agreed that the mine foremen, or their assistants, are the ones in a company organization who are best qualified to say what kind of an approach should be made to each workman who is not doing his part. Efforts are also being made toward building up, in mining communities, a strong civic sentiment against "slacking" so that a part-time worker will lose caste among his neighbors.

When all persuasion fails there remains the possibility of invoking the draft; that is to say, a miner would have a deferment rating only as long as he stays on his particular job. This course has also been proposed for industries other than coal mining and we are all agreed that it should be considered only as a last resort in the case of a chronic flagrant offender.

Changing Location

A cooperative action to stop the loss of working time that is resulting through men drifting from one company to another should be put into force by coal operators. The immediate reaction to this proposal is, of course, negative; most mining men feel that such concerted action would be impracticable and many examples can be cited where previous agreements, on other cooperative matters, have broken down because one or more companies failed to abide by the rules. It is true that this situation has existed in the past, *but today our country is at war* and in order to correct a harmful labor condition that may retard production, it would certainly seem that the coal industry should, in this national emergency, be able to get together and police itself.

DIRECT CURRENT WIRING FOR CONVEYOR MINING

By W. F. ROBERTS

Part II of a Report of the Power Subcommittee

IN the June issue of the MINING CONGRESS JOURNAL, Part I of this report was published and Part II, which is published here, completes the report by presenting further details.

Trailing Cables

Conveyor mining has introduced many new power distribution problems and has required changes in the equipment and practices formerly used for hand work. Among these changes is the discontinuance of the cable reel for the face machines. This device is satisfactory for mobile machines where there is frequent winding and unwinding of the cable, as under such use the heat generated in the conductor has opportunity to radiate. In a conveyor operation, however, the reel remains stationary and is apt to contain a number of layers of cable; as a consequence there is no opportunity for the heat to radiate and excessive temperatures will build up. This temperature rise introduces a fire hazard and will also materially reduce the carrying capacity of the conductor, as explained in a previous report of the Power Committee, published in June, 1941.

It has therefore become necessary to adopt some substitute for the reel; one method is to coil the cable loosely in an open box mounted on skids and another method is to use short lengths of cable which are connected as the room advances. Both practices have their advocates, but there seems to be an increasing trend toward sectional cables—usually 100 ft. long, or some even multiple of the room length.

Specifications for Connection Boxes

When sectional cables are used, a suitable type of connection must be provided; this must be constructed so as to make a positive insulated junction, the terminals must be guarded against accidental breaks in contact and, when permissible equipment is needed, the box must be explosion-proof. The following are the requirements for an explosion-tested cable connection and the wiring diagram is shown in Figure 4.

1. Cables must enter the box through packing sleeves or packing glands; sleeves are preferable since the cable may be packed in the sleeve beforehand to facilitate adding a section of cable quickly. Packing sleeve must have a flame proof fit in the connection box and be securely fastened in place (usually by means of studs, nuts, and lockwashers).

2. The metal box shall have lugs for fastening to roof or room posts. For access to terminals it shall have either a screw cap with a lock or seal, or a bolted-on cover with flame-proof flanges.

3. A suitable clamp shall be provided for each cable to prevent any strain coming on the terminals.

4. Provision shall be made both inside and outside the box for fastening a ground wire, since it may be either separate or part of a multi-conductor cable.

5. Connections inside the box shall be made by bolting terminals to insulated terminal studs; by means of clamp terminals; or by other approved methods.

Connections for Drills on Cutting Machines

In Part I of this report, Figure 1 shows a conveyor operation with several machines at the face and with a face distribution box where each of these machines has its separate power connection. However, in some conveyor operations the only motor-driven equipment at the face are the cutter and the drill, and in such cases the face distribution box can be eliminated by providing, on the cutting machine, a plug outlet for the drill. The operator of a hand drill must be very positively protected against short circuits or grounding; a wiring system for this type of installation is illustrated in Figures 5, 6, and 7, and the following specifications are recommended for Government-Approved plug connections:

1. Plugs used to obtain energy from mining machines shall be interlocked with a switch, or so connected that the plugs can neither be inserted nor withdrawn while the receptacle contacts are alive.

2. A suitable clamp shall be provided for the cable entering the plug to prevent any strains coming on the plug while it is in its receptacle.

3. A cap or suitable cover to be locked in place to prevent access to live terminals and to keep out dirt shall be provided to close the opening in the receptacle when the plug is out.

4. A chain or its equivalent shall be provided to prevent loss of the cover.

5. The drill cable connected to the plug must include a grounding conductor for grounding the drill frame to the frame of the mining machine.

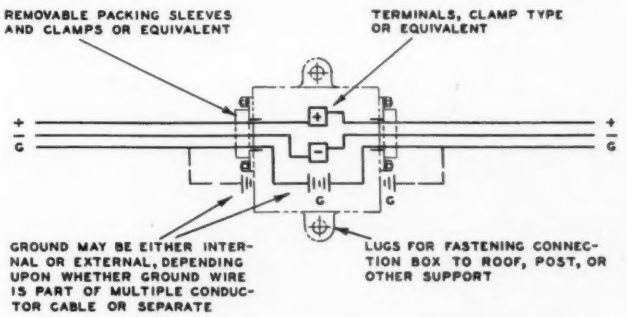


Figure 4.—CONNECTION BOX
For sectional lengths of trailing cable suitable for open type or Government approved equipment

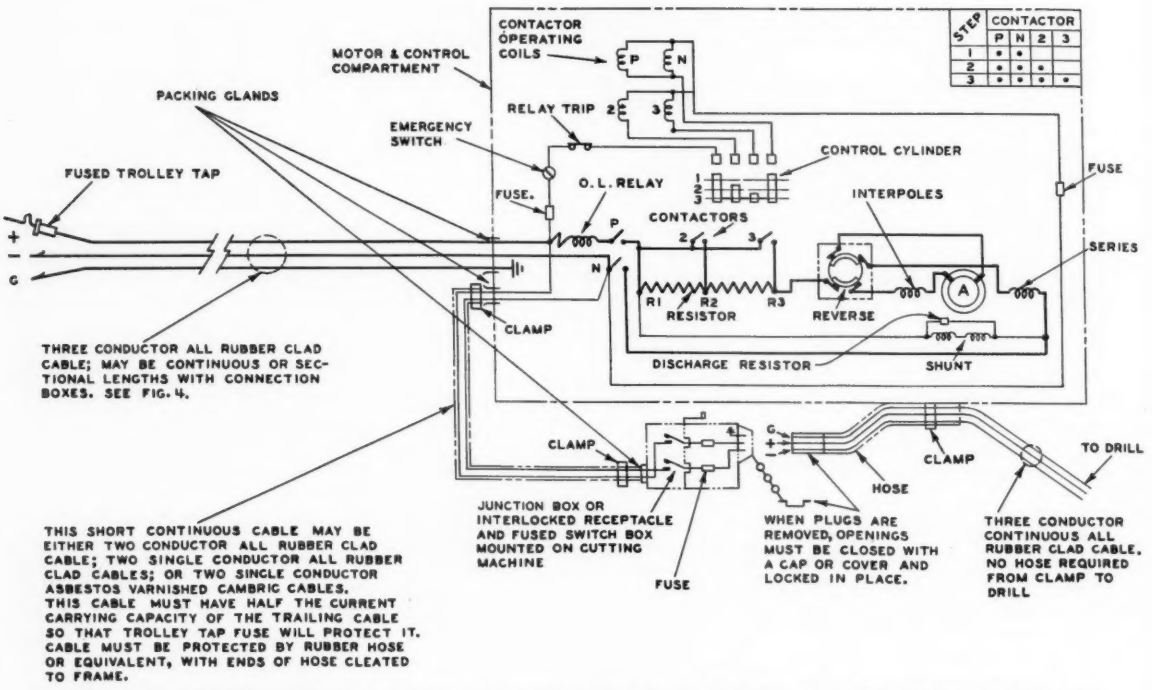


Figure 5. RECOMMENDED METHOD OF CONNECTING DRILLS TO A SHORTWALL MACHINE

When the machine has an overload relay for overload protection and contactors for opening positive and negative lines. Suitable for d.c. open type or Government approved equipment

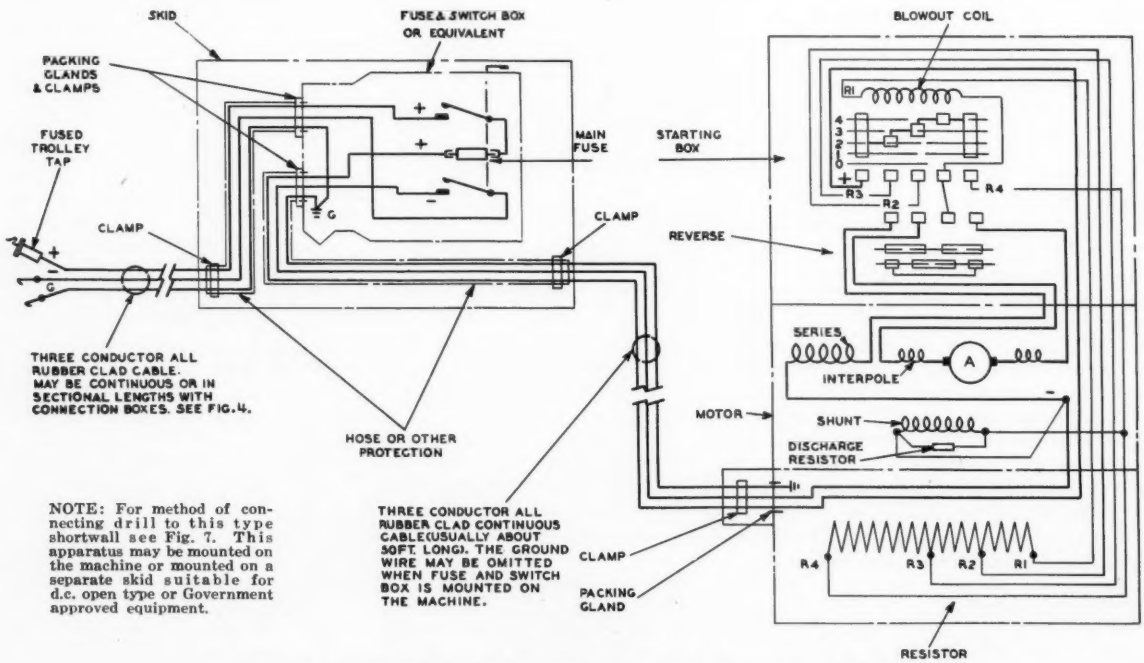


Figure 6. CONNECTIONS FOR A SHORTWALL MACHINE

In which positive and negative lines are opened manually by a switch or circuit breaker and overload protection is interlocked with the switch or circuit breaker

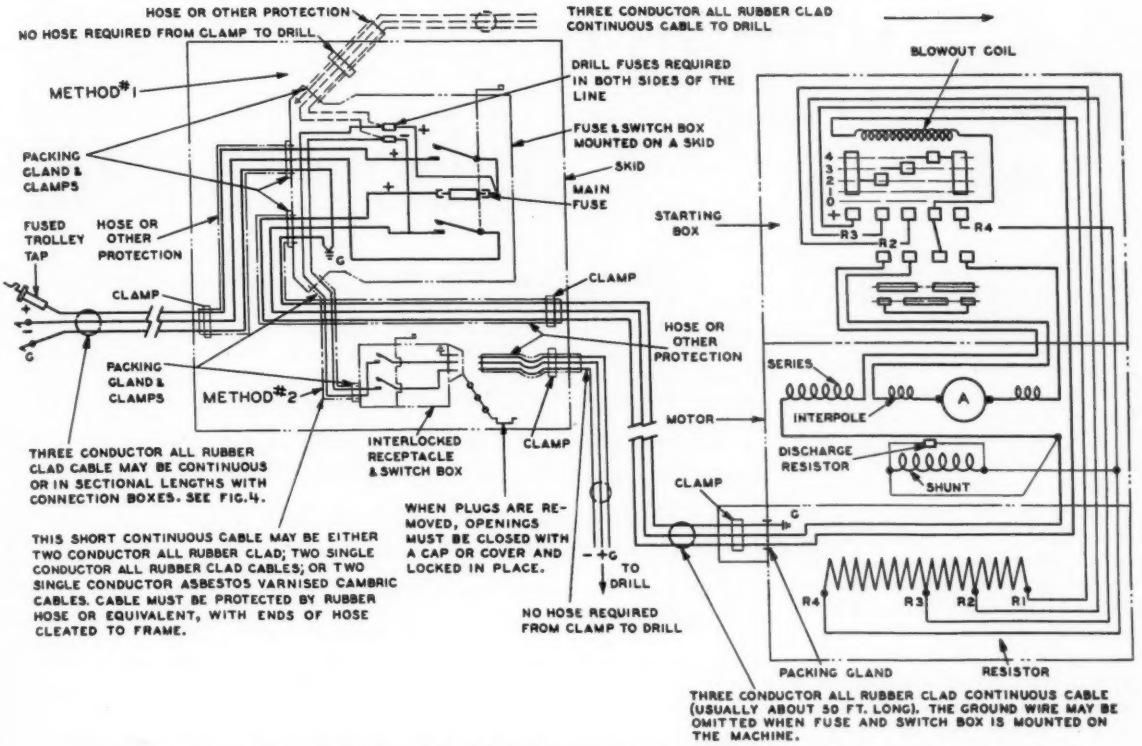


Figure 7.–TWO METHODS OF CONNECTING A DRILL TO A SHORTWALL MACHINE
Of the type shown in Figure 6. NOTE: Method No. 1 shows permanent drill connections (in dotted lines). Method No. 2 shows separable drill connections using interlocked receptacle and switch box. Suitable for d.c. open type or Government approved equipment

6. The plug and receptacle each shall contain a grounding contact that will make on inserting the plug. Metal plug and receptacle housings shall be grounded when the plug is in place.

7. Fuses or equivalent shall be provided in the mining machine or in the switch and receptacle compartment for protecting each power conductor of the drill. Fuses must be interlocked with a switch so that they may be renewed only when the switch is open and the fuses dead. Figure 5 shows a wiring arrangement in which the fuses are in the switch and receptacle compartment, while Figure 7 shows a wiring arrangement in which the fuses are in the fuse and switch box for the mining machine.

8. The receptacle cap shall be marked plainly with a plate or other suitable means, to read as follows: "CAUTION, see approval date for directions for use."

9. Approval plates on cutting machines provided with drill outlets shall include a statement as follows: "The receptacle on this machine shall be used only for connecting permissible machines taking not more than —— amperes."

Conclusion

In preparing the drawings which accompany this report, the committee has endeavored to make these as simple as possible so that they would be understandable by the operator and mining engineer who are not trained electricians. Figures 5, 6, and 7, by the nature of what they are designed to show, are more complicated than the preceding drawings; the principles, however, should be clear to the average operator.

This report has been prepared by the sub-committee as tentative recommendations to the Power Committee as a whole for their review. Some changes may be made in this draft before its final adoption as a formal committee report, but in the meantime it will be appreciated if comments or suggestions from the industry are forwarded to the American Mining Congress.

Drill operator must be protected against grounding and short circuits

WHEELS of Government

● *As Viewed by A. W. Dickinson of the American Mining Congress*

Washington Highlights

WASHINGTON—Capital of world strategy.

REVENUE BILL—"Too little—too late"?

WAGES AND HOURS—Supreme Court speaks at last.

SMALL WAR PLANTS BILL—Detours anti-trust laws.

FOR SMALL MINES—New $5,000 loan not a grubstake.

MINE LABOR—Manpower Commission recognizes shortage.

TRADE AGREEMENTS—White House order waives duties.

SILVER—Allies want some.

MINE MOTOR TRUCKS—ODT shotgun order needs streamlining.

A CENTURY ago Boston, Gloucester and Baltimore clipper ships carried our flag at the peak of graceful rigging on the world's seven seas. Today, in a wartime world, the flag has again encircled the globe on our ships of war and cargo carriers and on fighter and bomber planes engaging the enemy in Rumania, Africa, China and over the almost limitless expanses of the blue Pacific. To Washington from the far, embattled countries borne by the modern air clippers, or landing from immense circling bombers beside the placid waters of the tidewater Potomac, comes an unending string of royal rulers, premiers and high ranking strategists to discuss wartime policies, economics and political repercussions. Inevitably the wants expressed by one and all of these visitors and allies of ours are for more—more goods, munitions, food, ships, money—and more men.

This country is answering these appeals in its unprecedented production of steel, copper, lead, zinc, fuels and all the munitions of war which stem from these and many other natural resource materials. The money too is apparently forthcoming as the House Committee on Ways and Means and the representatives of the Treasury sway to and fro in their titanic efforts to wring an additional $8.7 billion from the taxpayers of the United States in the effort to take a possible $28-billion total for the year 1942.

Battle on Revenue Bill

Several members of the Ways and Means Committee took Treasury Secretary Morgenthau to task in early June for his statement in a radio address that the results of the Committee's work on a wartime tax bill might prove to be "too little and too late." Chairman Robert Doughton, from the North Carolina hill country, promptly called the Secretary before a night session of the Committee at which the differences were apparently adjusted, or at least a truce was arranged.

One Committee action of interest to many older mining companies was the vote of 11 to 4 extending the present provision of Section 115 of the revenue laws which exempts from income tax the distributions to stockholders from pre-March 1, 1913, earnings and surplus.

When percentage depletion was placed in the Revenue Law of 1932 for coal and metal mines and sulphur, the law and the subsequent regulations were so worded that mining companies which failed to elect to take percentage depletion in 1932 and in 1934 were denied this form of deduction in subsequent years. In both 1932 and 1934, efforts were made to secure wording in the law, which would permit the mining taxpayer an option to take either percentage depletion or unit basis depletion each year. This effort had continued during the course of each subsequent revenue bill, and it is now extremely gratifying to report, that through the efforts of Congressman Wesley E. Disney of Oklahoma, Section 114 (b) (4) has been amended by the Committee on Ways and Means, acting in agreement with the Treasury, to eliminate the requirement for a binding election and to include the words "except that in no case shall the depletion allowance . . . be less than it would be if computed without reference to this paragraph."

By this wording a mining company now has an automatic election to take percentage depletion in the taxable year 1942 and subsequent years, or it may exercise the option in any year to compute its depletion deduction on a unit basis. In many cases the unit basis is particularly important in low earnings years when the 50 percent-of-net-income limitation on the percentage depletion basis may deny to the taxpayer a proper return of the capital value of his ore body or coal bed.

Under Committee action, partnerships and individuals will be entitled to use the sixty months amortization of wartime facilities. Among excise taxes approved is that of 5 percent on transportation of freight by common carriers; this will be severely felt by shippers of marginal ores as well as by coal producers who are at a geographical disadvantage. Restoration of consolidated returns for normal and surtax purposes carries a penalty of an additional tax of 2 percent upon the surtax net income, and a requirement that the taxpayer must make a binding election as between consolidated or separate corporate returns.

Committee action thus far has lib-

eralized capital gain and loss provisions by setting 15 months as the "break-line" between short-term and long-term transactions; regular income tax rates are applied to short-term gains and a maximum tax of 25 percent fixed on long-term gains; losses from either long- or short-term holdings may be offset against any gains therefrom; net losses of either short- or long-term holdings are deductible from other taxable income up to the amount of $1,000 a year; a five-year carry-forward is granted for either type of loss, as a deduction from gain, or from other income in an amount not to exceed $1,000 a year.

The Ways and Means Committee hopes to secure passage of the Revenue Bill in the House by mid-July.

Supreme Court—Wages and Hours

From the sound and solid state-rights domain of Texas, a Dallas publisher, the A. H. Belo Corporation, fought its way to an yearly June decision in the Supreme Court of the United States. The Belo Corporation had an employe contract embodying a weekly guarantee equal to the pre-Wage-Hour law weekly salary. This procedure was considered an evasion of the law by the Wage and Hour Division of the Department of Labor as the Division held that the hourly rate named in the employe contract avoided any increase in the company's wage cost. The decision of the Supreme Court upheld the employer's contract with the employes, which complied with the wage and overtime provisions of the Act, and stated that the weekly guarantee did not affect the "regular rate of pay" on which overtime was computed.

Wage-Hour Administrator L. Metcalf Walling immediately came forward with a statement that the Court had passed only on the particular facts in the Belo case and that the Wage and Hour Division would be guided by a simultaneous decision in the case of the Overnight Motor Transportation Company of Baltimore, in which, he said, the Court had declared that the overtime benefits of the Act are limited "neither to that marginal group of workers who are paid wages at or near the minimum rates prescribed in the Act, nor to employes who happen to be compensated on an hourly basis." He contended that salaried workers who are employed in interstate commerce must be compensated for weekly hours in excess of 40 at not less than one and one-half times their regular rate of pay, and that the regular rate for this purpose is to be computed through dividing the weekly wage by the number of hours worked in a particular week, where the employment contract is for a fluctuating work-week.

Anti-Trust in Wartime

The "Loans for Small Business" bill introduced and enacted through the efforts of Senator James E. Murray of Montana not only provides a "Smaller War Plants Corporation" with a $150 million loan fund to finance plant construction and expansion by small business enterprises, but also stays the hand of the anti-trust laws during wartime. It authorizes the War Production Board Chairman, after consultation with the Attorney General, to certify production programs as necessary to the conduct of the war without regard to the anti-trust and Federal Trade Commission laws.

The new Act also authorizes the Reconstruction Finance Corporation to make loans to partnerships and individuals as well as corporations, and thereby broadens in a most important way the scope of the RFC in the making of small mine loans.

RFC Aids Strategic Metals

In pressing for the enactment of his "Class C" Small Mine Loans bill (S. 1388), on which a hearing had been set before the Senate Banking and Currency Committee on June 9, Senator Ernest W. McFarland of Arizona, in an exchange of correspondence, was advised by Chairman Charles B. Henderson of the RFC on June 5 that RFC's Circular 14 would be reissued to place in effect the provisions of this bill. Circular 14 has since been reissued containing the following language:

"When deemed by the RFC to be advantageous to the national defense, loans up to $5,000 will be made for the purpose of unwatering, retimbering, making accessible, or other preliminary development work, or the sampling or assaying of ores, when in the opinion of the RFC it reasonably appears that the expenditure may make accessible or reveal sufficient mineral showing to warrant a Development Mining Loan."

Thus, this type of loan is now made possible and because of the terms of the Murray Small Business Loans bill it is available to individuals and partnerships as well as to corporations.

In addition to the liberalization of its specifications and terms of payment and handling of strategic metals, ores and concentrates, the Metals Reserve Company has now made arrangements whereby small producers of manganese and chrome ores may bring truck or wagon loads to purchasing depots established at many points in the West. Producers will be paid for their ores as soon as lots of ten tons or more have been delivered and assayed. In the case of both manganese and chrome ores a minimum ore con-

Union Station in Washington, D. C. The marching, shuffling and scraping of thousands of feet each day is slowly eroding depressions in the softer limestone blocks in the mosaic marble floor of this busy depot.

tent of 35 percent is required but on chrome ore concentrates the briquetting penalty of $3 per ton has been dropped. In addition to ore-buying stations at Yreka, Calif., and Seneca, Grants Pass and Coquille, Oreg., others are being established at Phoenix, Ariz.; Auburn and Tracy, Calif.; Salida, Colo.; Battle Mountain, Nev.; and Deming, N. Mex.

Manpower at the Mine

With labor supply and military draft deferment problems becoming more acute in mining operations, importance is attached to the appointment of Brigadier General Frank J. McSherry as Director of Operations of the War Manpower Commission. General McSherry is a graduate in mining engineering of the University of Arizona and thus most fortunately at this time he brings to the War Manpower Commission a knowledge of the problems of mining.

The Selective Service System under General Hershey has reissued to local draft boards over the country Occupational Bulletin No. 4, which carries a list of the critical occupations in the anthracite and bituminous coal industries. Principal changes in the reissued order are reduction in some of the indicated training periods; for example blasters, brakemen and car repair men were reduced in classification from "one year and less than two years" to "less than six months."

It is anticipated that an occupational order for metal and nonmetallic mining and milling will issue at an early date carrying a list of some sixty critical occupations in the industry; and a further occupational order covering critical occupations in smelters and refineries is in course of preparation.

Presidential Order Waives Metal Duty

Reenforcing the arguments advanced by the American Mining Congress at the Bolivian-Mexican foreign trade agreement hearings, against any permanent reduction in duties on lead, zinc, mercury, tungsten, antimony, molybdenum, fluorspar and other mineral products, a Presidential order early in June authorized emergency purchases of war materials abroad and their importation into the United States free of duty. The Secretaries of War, Navy, Treasury, Agriculture, and the RFC may now make duty-free purchases of raw materials from foreign countries. As granted, the authority carries on until the termination of the War Powers Act. Commerce Secretary Jesse Jones has announced that the imports will be sold at ceiling prices fixed by the Office of Price Administration and thus will not react to harm our domestic producers of mineral products. This desirable status has been repeatedly urged by representatives of the mining industry from all parts of the country.

The provision for duty-free importation of minerals for the war period, it is felt, should make it clear that no duty concessions through the medium of trade agreements are needed as an aid to the war program.

A recent discussion between representatives of the American Mining Congress and the Chairman of the Trade Agreement Committee of the State Department has developed the informal assurance that no action will be taken under the proposed Bolivian-Mexican trade agreements which in the Committee's judgment will adversely affect the war program. It is understood that the "country committees" are engaged in collating the information presented by interested persons in briefs and by oral presentation, and it is reasonable to believe that the mineral branches of the War Production Board will also be consulted concerning the effect of any possible duty reduction on the war program.

Silver in Demand

Thus far the Senate Special Silver Committee has not given its approval to a bill submitted by the Treasury which would authorize the transfer of 53,000 additional tons of silver to service in war production plants. It is said that the members of the Committee are fearful that the bill in the course of its passage in the Senate and House might have amendments added which would do harm to the domestic silver purchase program.

Very recently Secretary Morgenthau has stated to the Committee that Great Britain and Australia are asking for silver and that Britain desires two and one-half million ounces each month. The Secretary is said to have stated that there is a growing demand for silver. Senators McCarran of Nevada and Johnson of Colorado immediately suggested silver sales or loans to foreign countries on the basis of $1 or $1.29 per ounce.

It is now considered quite doubtful that there will be any legislation authorizing transfer of Treasury silver to war production facilities; in fact, it is generally considered that the Treasury has the power to loan the silver for use in war production plants. In the event of any sale or loan of silver abroad there will be vigorous demand that this only be permitted at higher prices than now paid for domestic silver.

Mine Motor Trucks Must Operate

Some measure of relief is now in sight from the "shotgun" type of order issued by the Office of Defense Transportation under Nos. 3, 4, 5 and 6. Orders 3 and 4 affect common and contract motor truck carriers, respectively; Order No. 5 affects private carriers, and Order No. 6 affects local carriers operating within a 25-mile radius.

Under Order No. 5, as amended, a private carrier on hauls of more than 25 miles must provide 75 percent of a normal load on the backhaul. Under Order No. 6 a local carrier would be required to effect a 25 percent reduction in truck mileage by comparison with mileage performance in equivalent months of 1941. Vigorous protests have been made against these impracticable provisions as they affect mining operations, and the ODT orders are now being rewritten with a view to removing the provisions which are impossible of compliance, by the time the orders go into effect on July 1.

Keep the Mines Supplied

The Production Requirements Plan for the more complete allocation control of metals and other scarce materials has been put into effect by Priorities Regulation No. 11. The PRP will really operate under administrative methods developed under Dr. Wilbur A. Nelson in the Mining Branch of WPB. Mining and smelting companies will continue to operate under Orders P-56, P-58, P-68 and P-73, using a percentage of the total supply of materials which will be set aside by the Requirements Committee for the use of mines and a few others not subject to the orders.

Priorities Regulation No. 3, as amended, has greatly simplified the certification of preference ratings to a supplier.

After July 1 all purchasers must include on purchase orders the identification symbols of the Allocation Classification System established by Priorities Regulation No. 10. The coal mining symbol is 8.10 and that for metal mining is 9.30.

PERSONALS

T. R. Johns, vice president and general manager, Industrial Collieries Corporation, Bethlehem Steel Company's coal mining subsidiary, retired from active service June 10. Mr. Johns, who is able to look back upon 66 years of continuous service in the coal mining industry, became affiliated with Bethlehem Steel Company 27 years ago, in 1916, at the merger of this company and the Pennsylvania Steel Company. During his connection with Bethlehem he had outstanding success in his work, and the credit for building up Bethlehem's coal properties and coal-producing facilities from a relatively small beginning in Heilwood to their present magnitude, must largely go to him. He enjoys a well-deserved reputation as one of the leaders in the coal mining industry, is recognized as one of the best authorities in the country on the subject of coal, and leaves a large number of friends in his organization who have learned to respect him for his high character and fine qualities of leadership.

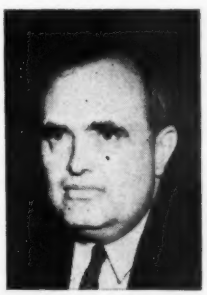
T. R. Johns

In the past Mr. Johns has served as chairman of the Advisory Board of Mining, Pennsylvania State College; also for a number of years as a member of the Mining Advisory Board of the Carnegie Institute of Technology and the U. S. Bureau of Mines, Pittsburgh. He is a member of the Engineers Society of Western Pennsylvania, Pittsburgh, Pa., and the Coal Mining Institute of America, Pittsburgh, Pa., of which he is the oldest living member. Mr. Johns is quite active in the American Mining Congress, Washington, D. C.; the American Iron and Steel Institute, New York; and the American Institute of Mining and Metallurgical Engineers, New York.

K. M. Quickel, who succeeds T. R. Johns as general manager of Industrial Collieries Corporation, graduated from Pennsylvania State College in 1911. After working for coal companies in Tennessee, eastern Kentucky, and West Virginia he became affiliated with Industrial Collieries in 1916 as assistant engineer at Heilwood. Later he became chief engineer, and in 1923 he came to Johnstown as special engineer. He was made assistant to the general manager in 1934 and assistant general manager in 1940.

T. J. Crocker, who has been appointed assistant general manager of Industrial Collieries Corporation, is also a graduate of Pennsylvania State College, year 1915. After his graduation he worked for a short time in the mining department of the Midvale Steel and Ordnance Company. Service in the first World War was followed by employment at the Slickville mine and later at Bentleyville. He came to Johnstown as chief mine inspector in 1926 and in 1934 he was named superintendent of industrial relations for Industrial Collieries. In 1940 he became assistant to the general manager.

Reginald S. Dean, chief of the Metallurgical Division, Bureau of Mines, has been appointed assistant director of the bureau, coincident with a streamlining of the bureau's administrative organization, according to an announcement made recently by Secretary of the Interior Harold L. Ickes.



Reginald S. Dean

The changes which have been made, Secretary Ickes said, stem from the increased functions and the enlarged amount of vital work thrust upon the Bureau of Mines by the war. To carry out with greater speed and efficiency the large responsibilities of the bureau in the field of metallurgy, exploration for strategic minerals, production of helium for the Army and Navy, petroleum and coal research, explosives control and security of mineral production, Doctor Dean has been selected to work with Dr. R. R. Sayers, director of the bureau, in effecting the reorganization. Before joining the Bureau of Mines staff in 1929, as chief engineer of the Metallurgical Division, Doctor Dean held positions in the research departments of two western mining companies, the American Zinc, Lead & Smelting Co. and the Anaconda Copper Mining Co., and as metallurgical development engineer for the Western Electric Company. He attended the University of Missouri School of Mines, located at Rolla, Mo., and graduated from there in 1915. The following year he received from the same university his M.S. degree and later a degree in metallurgical engineering. He did graduate work in metallurgy and related fields at the University of Chicago and Harvard University, and at the University of Maryland, which awarded him a Ph.D.

C. E. Hough has been appointed superintendent of the Lochgelly mine of the New River Company, at Lochgelly, W. Va. Mr. Hough was formerly superintendent of the No. 5 mine of the West Virginia Coal and Coke Corporation, Omar, W. Va.

Dr. Arnold C. Fieldner, chief of the technologic branch and chief of the Coal Division, Bureau of Mines, will be awarded the Melchett medal, awarded annually by the Institute of Fuel of England, sometime this year. Dr. Fieldner, a chemical engineer and scientific research worker for 35 years in the department, thus will become the second American so honored since the medal was first awarded in 1930. Among the earlier recipients of the award are: Charles M. Schwab, the United States; Sir John Cadman (the late Lord Cadman), England; Dr. S. Bergius, Germany; and Mon. Etienne Audibert, of France. The medal is awarded for outstanding achievement in work involving the scientific preparation or use of fuel.

Dr. Arnold C. Fieldner

James R. Hobbins, president, Anaconda Copper Mining Company, recently announced that **Frank A. Wardlaw, Jr.**, had been appointed assistant manager of the International Smelting & Refining Co., Salt Lake City, Utah, effective June 1, 1942. During the past four years Mr. Wardlaw has been assistant general manager of the Inspiration Consolidated Copper Company, at Inspiration, Ariz. Mr. Wardlaw was named general superintendent of mines for the International Smelting & Refining Co. in 1929 and in 1930 he went to Inspiration Consolidated Copper Co., as general superintendent, holding that position until he became assistant general manager in 1938.

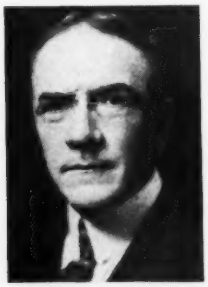
Martin H. Crego, manager of sales of the Phelps Dodge Corp., was honored on June 1 by a committee of executives and employes upon completing 50 years of service with the company.

William H. Goodrich, formerly assistant superintendent, Chino Mines, Nevada Consolidated Copper Corp., Santa Rita, N. Mex., has been appointed superintendent of mining operations, succeeding the late Harry A. Thorne.

William E. Kennedy, vice president of Anaconda Sales Company, in charge of copper sales, was honored by his associates on May 21 upon his 40th anniversary with the company.

Abe Fortas, general counsel to the bituminous coal division has been nominated by the President to be Under Secretary of Interior, succeeding **J. J. Dempsey,** who is now candidate for governor of New Mexico.

Howard N. Eavenson, Pittsburgh mining engineer and consultant, has been reelected president of Bituminous Coal Research, Inc., research agency of the bituminous coal industry and affiliate of the National Coal Association. Two new directors, **W. C. Hull,** vice president, Chesapeake and Ohio Railway, Cleveland, and **Kenneth A. Spencer,** vice president, Pittsburg and Midway Coal Mining Company, Kansas City, have been named by the stockholders. All other officers and directors are being continued in office. President Eavenson reported that the stockholders had voted a change in the certificate of incorporation of Bituminous Coal Research, Inc., so as to class it as a corporation not for profit. It was pointed out that all funds of the organization are expended for research.



Howard N. Eavenson

Arthur Linz, chemical engineer for the Climax Molybdenum Company in New York City, has been appointed vice president, succeeding **Alan Kissock,** who resigned May 1. Mr. Linz will continue to direct the activities of the company in the chemical field and also have charge of the conversion plant at Langeloth, Pa.

Cleland N. Conwell has left his position with the U. S. Vanadium Corporation at Red Lodge, Mont., and is now employed with the Stearns-Rogers Mfg. Co., Denver, as construction engineer.

A. W. Thorson, Detroit, assistant fuel service engineer for the Chesapeake & Ohio Railway Company for the past two years, has been appointed assistant to the president of Carnegie Institute of Technology. He will assist **President Robert E. Doherty** in securing financial support for the Coal Research Laboratory, and will also aid **Dr. H. H. Lowry,** director of the laboratory, with his general business operations.

O. B. Clark was recently appointed manager of mines of the West Virginia Coal & Coke Corporation.

H. P. Nichols has been appointed division superintendent for the New River Company, West Virginia.

Maurice B. Bradley, since 1924 in charge of the Cleveland branch office of the Robins Conveying Belt Company, is now in active service as a major in the Coast Artillery Corps of the United States Army. Major Bradley is well known to industrial executives in the middle west, having been responsible for the installation of some very important materials handling machinery in that territory. The Cleveland office of this company will be under the supervision of **S. F. Knight,** who will also continue in charge of the Detroit office.

M. B. Bradley

John E. Norton was recently appointed consulting engineer to the Metals Reserve Company by Charles B. Henderson, president. **D. M. Rait** succeeds Mr. Norton as chief of the mines division. Mr. Rait will be directly in charge of administering mine loans.

W. C. Johnson, formerly sales manager of the crushing and mining machinery division, Allis-Chalmers Mfg. Co., Milwaukee, has been appointed general sales manager, with jurisdiction over the sales of all Allis-Chalmers products. **W. L. Maxon** succeeds Mr. Johnson as sales manager of the crushing and mining machinery division for the company. Mr. Maxon was formerly sales manager and chief engineer of the company's mining department.

Edwin J. Collins, formerly an executive of the former Calumet & Arizona Mining Co., has accepted a position with the U. S. Bureau of Mines. For the present Mr. Collins is located in Washington, D. C.

Freemont E. Wood recently assumed his duties as mechanical and electrical superintendent for the Basic Magnesium, Inc., Luning, Nev. Mr. Wood's previous position was in a similar capacity for the Minas de Matahambre at Matahambre, Cuba.

William Segerstrom recently assumed his duties as analytical chemist of the Golconda Division of the Nevada-Massachusetts Company at Golconda, Nev.

Wyllys R. Seaman, Jr., who formerly made his headquarters in Wallace, Idaho, for the Sink and Float Corp., recently joined the armed forces.

Raymond E. Wimber recently resigned as mine manager of the Gilded Age Mining Co., Ely, Nev., and has entered the service of the U. S. Army.

Walter Erickson, formerly mill foreman for the Howe Sound Co., Holden, Wash., is now employed by the U. S. Vanadium Corporation, Red Lodge, Mont.

Boyd J. Barnard has been appointed special representative of the RFC to receive applications for small mine development loans. Mr. Barnard can be reached at 1811 E. Ninth South Street, Salt Lake City, Utah.

Don Segerstrom was recently appointed chemical engineer at a tungsten mill in Utah.

G. C. Smith has been appointed general superintendent of the Dunedin Coal Company, Dunedin No. 1 mine, and Fire Creek Coal & Coke Company, Mason No. 1 mine.

The Big Sandy-Elkhorn Coal Operators Association held its annual meeting June 5 and the following officers were reelected: President, **Harry LaViers,** vice president, **L. C. Campbell;** secretary, **H. S. Homan;** and treasurer, **H. H. Kuhling.**

L. H. Hinckley has been named supervisor of the Rocky Mountain district of the WPB Mining Branch. **Howard A. Storm,** faculty member of the Colorado School of Mines, has been appointed technical advisor and assistant to Mr. Hinckley.

Clarence F. Zeuch has resigned his position as district manager of the Cleveland Rock Drill Company, Wallace, Idaho, and has joined the Bureau of Mines' staff at Moscow, Idaho. **William G. Lundstrum,** who has been with the Cleveland Rock Drill Company, located in the southwest, has been transferred to Wallace, Idaho.

Gerald J. Ballmer was recently appointed assistant superintendent of the Chino Mines, Santa Rita, N. Mex., of the Nevada Consolidated Copper Corp. Mr. Ballmer started work at the Chino unit in the engineers office in 1925, and was a geologist from 1929 to 1934, at the time operations were suspended because of low copper prices. In 1936 when operation resumed he returned to Santa Rita and was employed in the capacity of general mine foreman.

Gerald J. Ballmer

Arthur Swanson, formerly mine superintendent at the Zeibright mine, Emigrant Gap, Calif., is now employed at the Gray Eagle mine, Happy Camp, Calif.

Dr. Robert D. Butler recently went to Alma, Colo., where he will undertake his usual summer geological investigations for the London Mines and Milling Company. Dr. Butler is a member of the geological department, Lehigh University, Bethlehem, Pa.

Brig. Gen. Frank J. McSherry has been appointed director of operations of the War Manpower Commission by Director McNutt. General McSherry has previously been working on labor supply and training problems with the Federal Security Agency and the War Production Board, on detail from the Army. General McSherry, a graduate of the University of Arizona, where he studied mining engineering, brings an understanding of the mining industry's problems to the Manpower Commission.

The retirement of **John McG. King**, manager of the Denver branch of the John A. Roebling's Sons Company, has been announced. Starting to work for the Chicago branch of the Roebling Company in 1905, he was transferred to Denver a year later, where he was stationed until his retirement.

John McG. King

King was born in New Alexandria, Pa. in 1877. His first job was with J. W. Ellsworth & Company in the late 90's, and in 1901 he was engaged by the Frick & Lindsay Company, distributors of Roebling wire rope, in their Pittsburgh office.

"Jack," as he is called by his friends, is one of the most widely known men in the western mining fields, where he has traveled extensively in mining districts from Alaska into southern Mexico during the last 36 years.

An aggressive and successful salesman for many years, he turns his managerial duties over to Homer H. Davis, who has been employed by the Roebling Company at the Denver branch for the past 15 years.

Stacy H. Hill, formerly located in New York City for the Ingersoll-Rand Co., has been transferred to the company's Salt Lake City office as district general manager.

B. E. LaLonde, of the mining and geological department of the Oliver Iron Mining Co., retired on June 1. Mr. LaLonde has had a long and varied career in the mining industry during the last 50 years. He has been with the Oliver Iron Mining Co. since 1905.

Richard F. Bergmann has recently been appointed chief engineer for the Link-Belt Company, with office at executive headquarters in Chicago. **William W. Sayers**, who has served in this capacity for the Link-Belt Company, has been appointed consulting engineer. In this newly created position he will continue to deal with patent matters and be available for consultation where his extensive knowledge of the company's engineering problems will be helpful.

George R. Drysdale was elected a vice president of the Phelps Dodge Corporation at a recent meeting of the board of directors in New York City. Mr. Drysdale has been comptroller of the organization since 1933 and secretary since 1937.

George Roddewig, who has been serving as consultant, Zinc Section, Office of Price Administration, Washington, D. C., is on leave of absence from official duties and is at his home in Berkeley Hills, Calif. **Hugh R. VanWagenen**, consulting mining engineer of Los Angeles, Calif., will take Mr. Roddewig's place during his absence.

Dr. Ellis E. Jensen, executive director for Wisconsin of the National Conference of Christians and Jews for the past three years, has been employed as a research assistant in the industrial relations department of the Allis-Chalmers Manufacturing Co., it was announced recently by Lee H. Hill, vice president of the company.

— *Obituaries* —

Edmund M. Toland, general counsel for the House Naval Affairs Committee, died suddenly of a heart attack in Washington on June 4. He was 43 years old. Mr. Toland will be remembered by members of the American Mining Congress who attended the meeting of the Western Division in Colorado Springs in 1940 at which time Mr. Toland was general counsel for the special committee to investigate the NLRB. In his speech he said that findings of the special committee "would seem to warrant the conclusion" that any "fifth column" search should begin in the NLRB.

G. Donald Cowin, well known in the coal industry and for many years prominent in the Illinois field, died of a heart attack in a Chicago hospital on June 14, following a brief illness. Mr. Cowin was president of the Bell and Zoller Coal Co., Bell & Zoller Coal and Mining Co., Crescent Mining Co., and Centralia Coal Co. While his home was in Barrington, Ill., burial took place in Grand Rapids, Mich., where Mr. Cowin was born, June 14, 1887.

G. Donald Cowin

Kenneth Leith, consulting mining engineer and geologist, Amherst, Va., died June 10 at Lynchburg, Va., following a severe illness of only a few days. He was 40 years old.

The son of Dr. and Mrs. C. K. Leith, Madison, Wis., Mr. Leith followed the geological and mining profession of his father. After completing his studies at the University of Wisconsin he engaged in mineral work in South America, Mexico, Central America and in various districts in the United States. He was for several years geologist for the Vanadium Corporation of America, engaged in work for that company in Peru, in the western United States, and in Virginia as well as at the company's New York offices. He also served as consultant to the National Resources Committee in Washington from 1935 to 1937, during which he prepared an authoritative report on the mineral reserves of the United States and its capacity for production. He was a member of the American Institute of Mining and Metallurgical Engineers.

Surviving are his wife, Mrs. Kenneth Leith, Amherst, Va.; a son, Kenneth, Jr., age 15; a daughter, Mary Gordon, age 12; his parents, now residing in Washington where Dr. Leith has been mineral consultant to the War Production Board and its predecessors since June, 1940; and a brother, Andrew, also in Washington as chief of the Chrome-Manganese Branch of the War Production Board.

George L. Norris, chief metallurgist of the Vanadium Corp. of America, died at Roosevelt Hospital, New York City, on April 13. Mr. Norris was 76 years old. He was one of the pioneers in the development and application of vanadium.

William Emery, Jr., former president of the Cambridge Collieries Co., died on March 12, at the age of 49. Mr. Emery's home was in Harrisburg, Pa.

Joseph G. Hadley, employment and safety director of the Utah Copper Co. since 1918, died early in March this year at his home in Salt Lake City, Utah.

Charles Johnson, mining and civil engineer, well known throughout the southwest, died as the result of injuries suffered in an automobile accident near Richfield, Utah, on April 14.

Harry P. Davis, superintendent of the magnesium plant of the Permanente Metals Corp., at San Jose, Calif., was killed late in March in an automobile accident. Mr. Davis had been in charge of construction work for the Henry J. Kaiser interests for the last 15 years.

Hans P. Bjorge died at his home in San Marino, Calif., at the age of 86 on May 24. Mr. Bjorge is the father of Guy N. Bjorge, of Lead, S. Dak., general manager of the Homestake Mining Company.

Royal D. Gardner, well known mining engineer throughout the western mining states, died on April 7 at a Livermore, Calif., hospital. Mr. Gardner had been ill for a long time. For three years he was a member of the Western Mine Loan Commission for the RFC.

NEWS and VIEWS

VICTORY DRIVE FOR GREATER DOMESTIC METAL OUTPUT INAUGURATED AT BUTTE, MONTANA

Donald Nelson Starts Drive on a National Radio Address on 49th Anniversary of Miners' Day—Representatives of Mine Labor and Anaconda Officials Pledge All-Out Effort.

THE TRADITIONAL MINERS' day in Butte, celebrated on June 13 was this year featured by the inauguration of a drive for greater production in the non-ferrous mining industry. Persons from many of the copper and zinc mines around Butte and from Great Falls gathered to hear officials of the Anaconda Copper Mining Co., the War Production Board and labor leaders all pledge their maximum effort to produce more metals for the war offensives. Donald M. Nelson, chief of WPB, spoke to the people of Butte on a nationwide broadcast. He said, "I am very happy to talk to this opening program of the non-ferrous metal production drive today, because of the union of you men representing labor and management, is to me a symbol of something very important and encouraging which is happening in the United States. We are not going to win this war through the effort of any one group of people. It is going to take a united effort by all of us—an effort in which every man and woman in America forgets about his own personal interest and makes the good of the entire nation the most important thing in his life." Mr. Nelson stressed the importance of men staying on the job. "The people of America are relying on you for that drive. Stay on your job. Stick to the mining camps where you are now at work. You are as important to the battle as the pursuit pilot or the man behind the bomb sight. I know you will respond with body and soul—you men of the mines, you men of the front office, all of you joined together are enrolled in the battalions of democracy to sweep the Axis from the earth."

D. M. Kelly, Vice President in Charge of Western Operations for the Anaconda Copper Mining Co., responded to Mr. Nelson's appeal and said, "No industrial group in America, I venture to say, has a keener conscientiousness of the magnitude of our country's stake in this war, than have the men and managements of the non-ferrous metals producing industry. I venture further to say that no industrial group in America is more aware of its responsibility to the nation, than are we people who must produce the raw materials, the basic metals so vital to our country's arms.

"Though I speak as an operating officer of a single mining company, I do not feel presumptuous in saying that I am sure that I speak for the operators of all the non-ferrous metal mines of our great nation and saying definitely and positively that we shall not fail America in the vast task that is before us.

"Men and managements see eye to eye on this proposition and we stand shoulder to shoulder in a firm determination that there shall be no letdown, no shirking, no flinching on our part. My personal admiration for the effort that is being put forth by the employes of this, my own company, is tremendous. No more loyal or patriotic group of men can be found in industry anywhere in America. We are pooling our energies and our ideas, through our labor, management and production committee—'Victory Committee' if you please, in a single purpose cooperative effort to give our best."

James F. O'Brien, President of the Metal Trades Council, A. F. of L., was the third speaker. He pointed out that the Victory Labor-Management Committee in Butte is the first of its kind in the domestic mining industry. "This committee, working in conjunction with the War Production Board, is the answer to the Axis that they guessed wrong when they forced the United States to back up their statement, that free labor could out-produce all of the slave labor and the rest of the world combined."

Reid Robinson, Denver, President of the International Union of Mine, Mill & Smelter Workers, C. I. O., said, "We greet the Anaconda Copper Mining Company and hail with gratitude its decision to work side by side with us in increasing copper production, in order to defeat the Axis. This type of democratic unity will hasten the trip of Adolf Hitler to the waste dump of history."

Observers believed this demonstration of unity of purpose between labor

Attention of the mining industry was focused at Butte, Mont., on June 13 when these men joined hands in the pledge for all-out effort in boosting output of base metals throughout the nation. Front row, left to right: Reid Robinson, Denver, President of the International Union of Mine, Mill & Smelter Workers and Vice President of the CIO; D. M. Kelly, Vice President in charge of Western operations for Anaconda Copper Mining Co., and James F. O'Brien, Butte, President of the Metal Trades Council of the A. F. of L. Back row: Allen Buchanan of the Labor Advisory Board; Herbert Heasley, Labor Consultant; Bela Low, Labor Production Division, and Frank Ayer, Assistant Chief, Copper Branch, Materials Division, WPB

and industry promoted through the formation of Victory Committees offers possibilities for greater cooperation resulting in increased output of industrial products and raw materials. Frank A. Ayer, Assistant Chief, Copper Branch, WPB, following his attendance at the Miners' Day ceremonies visited other mining states and upon being questioned on the progress of the formation of Victory Committees in the metal mining industry, he said, "These Victory Committees are composed of the representatives of both labor and management who jointly work out every possible scheme for the greater production of metals. This plan which is now being used in Anaconda, Butte and Great Falls has been tried out for several months in different industries with excellent results. It has been found that men in the different plants have contributed ideas which have greatly increased output. At the start both labor and management were skeptical about this plan, which was proposed by Donald M. Nelson, as they thought it might be a scheme that would give the other side an unfair advantage. Opposite has been the case, however, and those who have given it a conscientious trial have wholeheartedly agreed that neither side has taken advantage of it. And it has been found that labor and management working together can achieve results which otherwise never could have been accomplished." On commenting about the events at Butte, Mr. Ayer said, "In the case of the miners, mill men, tradesmen and others of the Anaconda Copper Company, I was most impressed with the wholehearted cooperation displayed by both sides in the Victory Committee plan, and I have no doubt but that it will result in a substantial improvement in production."

Research Opens New Markets For Bituminous Coal

Heat without smoke issues from the new magazine stove developed at Battelle Memorial Institute, Columbus, Ohio

Improved equipment for the utilization of bituminous coal for comfort heating, for metallurgical applications, for the locomotive, and for power generation is foreseen by fuel engineers who addressed 140 representatives of the bituminous coal industry Thursday, May 28, at Battelle Memorial Institute, Columbus, Ohio.

The occasion was an all-day conference and exhibit on bituminous coal research and was sponsored by Bituminous Coal Research, Inc., the research agency of the bituminous coal industry. This research group is currently conducting a $200,000 program of research in the fuel laboratories of Battelle Memorial Institute.

Smokeless space heaters and service water heaters, completely automatic residential stokers, chemical treatment of coal to render it dustless. an industrial forge furnace which utilizes pulverized coal, and other new developments which will increase the markets for coal were demonstrated and discussed.

Howard N. Eavenson, president of Bituminous Coal Research, Inc., opened the conference with the statement, "This is the first presentation, to the subscribers, of the developments in equipment and of the technical information resulting from the research program which began in November, 1940, with your contributions. Remarkable progress has been made as you will hear and see."

"To the best of my knowledge, today's gathering of coal-industry executives is the largest ever assembled for the sole purpose of discussing research," commented Clyde E. Williams, director of Battelle Memorial Institute, in opening his remarks on "Research, the Key to the Future for Bituminous Coal." Growth of research in other industries was compared with that in coal to illustrate that modern industry depends increasingly upon research.

J. E. Tobey, chairman of the B. C. R. Technical Advisory Board, in addressing the group said: "We have only begun to tap the many possibilities for increasing and improving the use of coal. Old concepts about coal's limitations are becoming obsolete and new uses developed in proportion to the effort expended on research."

Speaking of the dustless treatment of coal, George W. Land, Battelle fuel engineer, stated that, in anticipation of the recent limitation order prohibiting the use of petroleum products for treating coal, Battelle had for some time been engaged in an investigation of other materials to allay dust. Mr. Land also presented the coal men with much new information on the absorption of spray oil into coal and on the relative merits of spraying and streaming oil on coal to reduce absorption.

New Smokeless Coal-Burning Heater Attracts Attention

The streamlined coal-burning space heater attracted considerable attention because of its modern appearance, smokeless operation, magazine feeding, and automatic control. The smokeless principle, developed under the joint sponsorship of the coal industry and 29 large stove manufacturing companies, has been adapted to a room heater, to a heater with separate heat exchanger, and to a service water heater.

According to Howard R. Limbacher, who has been associated with the development, over 40 percent of the urban homes of the country are heated by stoves, and normally about 1,000,000 are sold annually. The new heater meets the requirements of all smoke ordinances.

The problem of designing a completely automatic stoker for residential heating has no unique solution, stated Mr. Sherman, who disclosed that a stoker which incorporates a revolving burner head in the center of an underfeed retort has been nearing perfection in the Battelle laboratories. Coal introduced into the ignition zone is agitated and sprayed with air simultaneously to break up coking and to consume volatile matter. William B. Ramsdale discussed the merits of a second type of residential stoker, which will handle diffi-

cult coals with automatic removal of the ash. Both units were demonstrated in the laboratories.

Because of the impending shortage of oil for industrial heating, E. R. Kaiser, Battelle engineer, has investigated the possibilities of using pulverized coal or producer gas to replace oil and natural gas for steel making.

Coal for forging and heating furnaces was discussed by Richard B. Engdahl, Battelle engineer, and Bertrand A. Landry, assistant supervisor of Battelle's Fuel Division, discussed the application of pulverized coal to the Humphrey pump.

The pump is ideally suited for auxiliary duty at power dams to maintain power generation during low water. It can also serve to pump irrigation, city, and plant water.

Ralph A. Sherman told the meeting that the B. C. R. Technical Advisory Board had been apprised of plans for a new type of coal-burning locomotive that would be more smokeless, better able to burn the smaller sizes of coal, and have a negligible stack loss in cinders.

Typifying comments heard at the meeting, John D. Battle, executive secretary of the National Coal Association, remarked: "This is the first research meeting on coal that I have ever attended where practical developments were explained in non-technical language so that a business man without a research background could understand and appreciate what has been accomplished. I am enthusiastic about the results and believe that the benefits will be great."

National Safety Competition Winners Announced

Notable safety records achieved by mines and quarries in the prevention of accidents among mineral workers were recognized through the announcement of winners in the 1941 national safety competition, by Dr. R. R. Sayers, director of the Bureau of Mines, U. S. Department of the Interior. Two hundred and fifty mines and 151 quarries operating in 40 States participated in this safety competition, the 17th annual contest conducted by the Bureau of Mines.

The six groups comprising the contest are: anthracite mines, bituminous-coal mines, metal mines, nonmetallic mineral mines, open-cut mines and quarries.

The "sentinels of safety" trophies donated by the *Explosives Engineer* magazine were awarded to the winners in each of the six groups, and certificates of honorable mention were awarded to those ranking second, third, fourth, and fifth in each group and all others that had accident-free records and operated 30,000 or more man-hours during the calendar year.

Six bituminous-coal mines, two metal mines, five non-metallic-mineral mines, 14 open-cut mines, and 74 quarries had accident-free records throughout the year.

The trophy for the anthracite-mine group was won by the Eddie & Joe mine, Simpson, Lackawanna County, Pa. The mine was operated by the Eddie & Joe Coal Co., and its record for 1941 showed 82,638 man-hours of work with three lost-time accidents which caused 18 days of disability. The accident-severity rate was 0.218 per million man-hours of employment. This rate indicates the number of employe-days of disability.

The Alloy No. 2 mine, Alloy, Fayette County, W. Va., was awarded the trophy in the bituminous-coal mine group. This mine was operated by the Electro Metallurgical Company. During the year it was in operation 335,060 man-hours without a lost-time accident.

The Grasselli zinc sulphide mine, New Market, Jefferson County, Tenn., of the American Zinc Company of Tennessee, was awarded the trophy in the metal-mine group for working 216,044 man-hours without a lost-time accident.

The winner of the trophy in the non-metallic-mineral-mine group was the No. 6 gypsum mine of the United States Gypsum Co. This mine, located near Plasterco, Washington County, Va., operated 254,198 man-hours without a lost-time accident.

The trophy for the open-cut-mine group was awarded to the Mahoning iron-ore mine, Hibbing, St. Louis County, Minn., and was operated by the Pickands, Mather & Co. This mine was in operation 505,007 man-hours without a lost-time accident.

The Dolonah dolomite quarry won the trophy in the quarry group. This quarry, located near Bessemer, Jefferson County, Ala., was operated by the Tennessee Coal, Iron, and Railroad Company and was in operation 270,474 man-hours without a lost-time accident.

Montana Miners To Meet

The Annual Meeting of the Mining Association of Montana will be held at Livingston on September 4 and 5, and plans are now under way for the program and entertainment, according to Carl J. Trauerman, secretary-treasurer of the organization.

Inter-Mine First Aid Contests of Industrial Collieries Corp. Attracts Wide Interest

A total of 95 teams competed in the sixteenth inter-mine first aid meet of the Industrial Collieries Corp.

The Sixteenth Inter-Mine First Aid meets of Industrial Collieries Corp., a subsidiary of the Bethlehem Steel Corp., were held during June. The first contest was held at Ellsworth, Pa., on June 2, where 27 men teams, two boy teams and four girl teams participated, representing the three mines of the Ellsworth Division. The second contest was held at Barrackville, W. Va., on June 9, with 26 white and five colored teams representing the mines of the Marion Division. The third contest was held at Richard, W. Va., with 21 teams from the Preston Division. The fourth contest was at Johnstown, Pa., on June 13, with 21 teams representing the three mines of the Johnstown Division.

At each of these contests, cash prizes were awarded members of the four highest scoring teams. First prize was $25 to each team member, second prize $15 each, third prize $10 each, and fourth prize $5 each. Assisting with the judging of these contests were representatives from the United States Bureau of Mines, the Pennsylvania Department of Mines, the West Virginia Department of Mines, Pennsylvania State College School of Mines, West Virginia University School of Mines, representatives from a large number of mining companies, and from mining supply companies.

Overtime Exemption Granted For Sapphire Mining

Hydraulic mining of sapphires in the State of Montana is a seasonal industry within the meaning of the Fair Labor Standards Act, according to a finding made on June 9 by L. Metcalfe Walling, Administrator of the Wage and Hour Division, U. S. Department of Labor.

The Administrator's finding, which grants the industry permission to operate without payment of overtime up to 12 hours a day or 56 hours a week during a 14-week period each year, was made upon a prima facie case shown in the application of the American Gem Mines of Philipsburg, Montana.

National Rivers and Harbors Congress Disapproves St. Lawrence Project

At the National Rivers and Harbors Congress in Chicago on May 29 and 30, action was taken which constituted a virtual condemnation of the St. Lawrence waterway and power project. A resolution expressly disapproving the project was reported by the resolutions committee without a dissenting vote, but was protested on the floor on a parliamentary technicality. The chair upheld the protest and on an appeal, the vote against his ruling (and thus in favor of a condemnatory resolution) was nearly 2 to 1. Failing of a full two-thirds vote, the resolution was not formally adopted, but the predominant sentiment of the organization, consisting of congressional members and organizations throughout the country interested in rivers and harbors projects, in opposition to the St. Lawrence project, was plainly demonstrated.

California Copper Mines Busy

The Old Napoleon Copper Mine near Telegraph City, Calaveras County, is being rehabilitated by the Mountain Copper Co., Ltd. J. M. Basham, formerly in charge of the company's Big Canyon Mine in El Dorado County, is in charge of operations at the Napoleon. William F. Kett is general manager.

At the Copper-Gold property of the Gray Eagle Copper Company, rapid progress is reported being made on the construction of a new, large plant. A 23-mile power line has recently been completed and several buildings have also been erected. R. J. Hendricks is in charge.

Treadwell-Yukon Corporation Dissolved

At a meeting of the stockholders of the Treadwell-Yukon Corporation, held April 30, it was decided to dissolve the corporation and distribute the available capital assets. An initial distribution of 5 cents a share was made on June 15. The company was affiliated with the Bunker Hill & Sullivan Mining & Concentrating Co., and had been conducting mining operations in Alaska, Canada and the United States for the past 22 years. The properties operated in Alaska were in the Mayo Silver-Lead District of the Yukon Territory. Among other properties it owned the Errington mine in the Sudbury District, of Ontario, and the Wernecke and Sadie mines in the Yukon. In the United States the company owned the Tybo, Nidever and the Birum mines in Nevada and the Bodie mine in California. George T. Cameron was president of the Treadwell-Yukon at the time it was dissolved, P. R. Bradley, vice president and general manager and D. L. Feathers, secretary and treasurer.

Bureau of Mines Approves Permissible Equipment

Approvals 448 and 448A were issued on April 9 by the U. S. Bureau of Mines to The Jeffrey Manufacturing Company, Columbus, Ohio, on its Type L 600 Loader; 50 hp. motor, 250 and 500 volts, d.c.

Approval 447 issued on April 18 to the Goodman Manufacturing Company, Chicago, Ill., on its Type 91-C-17 chain conveyor; 10 hp. motor, 230 volts, d.c.

Anaconda Exploring For Strategic Minerals

An exploration office of the Anaconda Mining Company has been established in Reno, Nev., with Robert S. Moehlman in charge.

In various parts of the State, the company is conducting diamond drilling programs. Copper deposits in the Battle Mountain and Yerington areas are being explored. At the Copper Canyon group of gold-copper properties near Battle Mountain, the International Smelting & Refining Company is mining and milling more than 300 tons of copper ore per day.

Nevada Base Metal Mine May be Reopened

Rehabilitation is under way at the Old Commonwealth mine, near Reno. The property was recently examined by engineers for California interests and it is reported plans are under way for the rehabilitation of this lead-zinc mine.

Survey of Critical Occupations In Metal and Non-Metallic Industries

A list of "critical occupations" in metal and non-metallic mining and milling was certified by the U. S. Bureau of Mines to the Selective Service System on June 18. An occupational bulletin to local draft boards is to be issued, giving instructions that special consideration must be accorded men engaged in these key occupations, which require special qualifications, training or experience.

Meanwhile the situation in many mining regions is becoming more acute. Development work, upon which continued production depends, is already suffering through lack of manpower, and actual curtailment of production is imminent if relief is not provided. This situation is being presented vigorously to the officials concerned by the American Mining Congress, in order that the necessary relief may be obtained promptly through a separate mining order, covering at least the "critical occupations."

Government Officials Will Discuss Western Mining Problems

Plans for three hearings, or conferences of mining men, to discuss problems of metal production with particular reference to taxation, have been announced by Senator Pat McCarran of Nevada. Present plans call for a meeting in Reno, Nev., on July 16 and 17; in Salt Lake City, Utah, on July 20 and 21, and in Denver, Colo., on July 24 and 25. All mining men are invited to attend these conferences and opportunity for a full discussion of mine taxation and related problems will be afforded.

These meetings will be held pursuant to a resolution passed by the Senate on June 29, authorizing an investigation by the Senate Special Silver Committee. Senator McCarran has made arrangements for the meetings and hopes to have present also Senator Elmer Thomas, chairman of the Senate Special Silver Committee and as many other members as can attend. Secretary Morgenthau of the Treasury, had accepted an invitation to have a representative present, and that War Production Board Chief Donald M. Nelson had accepted a similar invitation; likewise Senator Walter F. George, chairman of the Finance Committee, was expected either to attend the meetings in person or to arrange for a member of the Finance Committee to do so. A special invitation was likewise extended to the American Mining Congress to participate and to assist in a thorough-going presentation of the industry's problems.

Industrial Fuel Engineering Conference Scheduled at Morgantown, W. Va.

A conference affording an opportunity for industrial consumers, equipment manufacturers, fuel and research engineers, to meet informally and to discuss fuel problems vital to war production is being sponsored by the Coal Bureau, Upper Monongahela Valley Association. The meeting will be held in the Minerals Industrial Building, West Virginia University, Morgantown, on July 24.

Speakers will be Julian E. Tobey, director, Coal Bureau, Upper Monongahela Association, and Dr. Charles E. Lawall, president of the West Virginia University. Papers to be presented during the morning session will be: History and Economics of the Pittsburgh Coal Bed in West Virginia, by H. N. Eavenson, Pittsburgh, Pa. The geology of this coal area will be discussed by Dr. P. H. Price, state geologist, West Virginia University. E. G. Bailey, vice president, The Babcock and Wilcox Co., of New York, has taken for his subject The Future of Northern West Virginia Coals. Meeting Wartime Fuel Demands in Industrial Plants will be the title of a paper presented by E. C. Payne, consulting engineer, Consolidation Coal Company.

In the afternoon session a paper entitled Latitude in Coal Selection Through Plant Modernization will be presented by Theodore Maynz, supervisor of power, American Viscose Co. The national fuel situation will be discussed by G. B. Gould, price executive, Fuel Division, Office of Price Administration, Washington. A staff of research engineers headed by R. A. Sherman, supervisor of fuels, Battelle Memorial Institute, will give an illustrated description of the splendid progress being made by Bituminous Coal Research, Inc., to improve coal utilization.

Relief Expected for Mines on Truck Haulage Order

The 51 field offices of the Office of Defense Transportation have received instructions from Washington headquarters to give full and impartial consideration to applications made by motor truck operators for special permits in connection with ODT truck conservation orders.

Applications are to be studied from the standpoint of their possible effect on the conservation objectives of ODT, and field managers are authorized either to issue special permits giving applicants full or partial relief, or to reject applications in their entirety. Appeal may be taken from the field manager's decision to John L. Rogers, director of the motor transport division, Interstate Commerce Commission Bldg., Washington, D. C. In filing an appeal, the applicant must show on what grounds appeal is based, wherein the field manager has failed to give sufficient consideration to facts set forth in the original application, or wherein field manager's decision is at variance with ODT objectives.

The effective date of General Orders ODT No. 3, 4 and 5 governing over-the-road operations of common, contract, and private carriers in excess of 25 miles, has been advanced to July 15. The return load requirements will not apply until after that date, and in the interim affirmative relief for mining operations is to be provided, according to ODT advices.

No change has been made in the July 1 effective date for General Order ODT No. 6 governing local carriers and requiring a 25 percent reduction in monthly vehicle mileage. An exemption for motor truck operations hauling mine products and waste materials is expected to issue in the near future. Meanwhile ODT officials recognize that essential mining production must not be curtailed; the exemption order is anticipated prior to the time at which the 75 percent-of-July-1941 limitation on vehicle mileage (called for under the present order) would be reached in July of this year.

Mining Branch Explains "Dollar Value Of Each Metal F. O. B. Mine or Mill"

As an interpretation of Form PD-400-A, covering quarterly quotas for metal mines, the mining branch has issued the following instructions with reference to Item 3, "Dollar Value of Each Metal F.O.B. Mine or Mill":

"Value shall be determined by multiplying the pounds of those metals contained in the ore or concentrates and paid for by a concentrator or smelter by the appropriate Engineering and Mining Journal quotation for the period in question without giving effect to deduction for treatment or for the cost of freight covering the transportation from the mine and/or mill to the mill or smelter."

Tungsten Ores and Concentrate Placed Under Allocation

Tungsten ores and concentrates were placed under complete allocation and end-use control by the Director of Industry Operations early in July, by an amendment to General Preference Order M-29. Ores and concentrates were not covered by the original order.

The amount of contained tungsten which may be delivered to any one person in any one month without restriction is reduced to a new maximum of 25 lbs. Prior figure was 100 lbs. The definition of tungsten was also broadened by the order to include any substance whatever containing recognizable tungsten, in any stage of process, except alloy steel, high speed steel, tool steel, and finished tools. The amendment allows delivery without restrictions of ores or concentrates containing less than 20 percent tungsten to processors for concentration, or dealers, though no dealer may hold such stocks longer than 60 days.

J. J. Forbes Heads Wartime Mineral Production Security Division

The U. S. Bureau of Mines has appointed three veteran mining men to its emergency Wartime Mineral Production Security Division. Chief of the new division will be John J. Forbes, who has been serving as chief of the Coal Mine Inspection Service. Assisting him will be William J. Fene and Simon H. Ash. Fene, who has been assistant to Forbes in the Coal Mine Inspection Division, will become chief of the Coal Mining Section of the new division, and Ash will head the Metal and Non-Metallic Mineral Mining Section. Dan Harrington, chief of the Health and Safety Service of the Bureau, will generally supervise the new division's activities, and will see that they are integrated with Explosives Control and Coal Mine Inspection work.

Under the Bureau's security program, emphasis will be placed upon the primary responsibility of owner-management. Director R. R. Sayers has stated that, "In all cases where possible the services of local enforcement officials will be utilized, and where additional protection must be provided, in whole or in part, by any other agencies, the property will be certified to the appropriate authority" by the Bureau.

Emphasizing the critical position in war production occupied by coal mines, metal and non-metallic mines, and smelting and metallurgical plants, Dr. Sayers stated that the objective of the security program is to prevent cessation of a single such activity through subversive action or hazardous negligence.

Kanawha Valley Safety Meet Will be Held

At a recent meeting of the board of directors of Kanawha Valley Mining Institute, a decision was reached to hold the 14th annual safety meet at Montgomery W. Va., on September 26. Lee M. Morris, secretary, said there will be as many first-aid teams in this year's event as participated last year.

Anthracite Section Elects Officers

At the annual meeting of the Pennsylvania Anthracite Section of the American Institute of Mining and Metallurgical Engineers held at the Valley Country Club, Hazleton, Pa., June 27, the following officers were elected for the coming year: S. H. Ash, Wilkes Barre, chairman; E. V. Evans, Lansford, vice chairman; Floyd Sanders, Wilkes Barre, secretary-treasurer. The executive committee elected for three years consists of Cadwallader Evans, Jr., Scranton; H. D. Kynor, Hazleton; L. D. Lamont, Pottsville; D. C. Helms, Lansford, and Edward Griffith, Wilkes Barre.

Smelters and Refiners Must Apply Under PRP

Smelters and refiners of metal which use more than $5,000 worth of metal in a quarter for maintenance and repair and for processing into forms not listed in the Metals List of Priorities Regulation No. 11 are required to apply for priority assistance under the PRP, under an interpretation to that regulation issued by WPB early in July.

In determining whether or not it must apply under the Production Requirement Plan, a smelter or refiner may exclude from consideration all metals which it processes only into forms described on the metals list. If the amount of metals processed into any unlisted form, plus metal used for maintenance or repair, totals more than $5,000 in one quarter, the smelter or refiner must apply under PRP.

Meanwhile a revision of Preference Rating Order No. 73, covering nonferrous smelting and refining, is under consideration.

Coal Company Starts Operation

May 4 marked the beginning of operations at the Gay Mining Company plant at Timbar, on Ben Creek, near Gilbert, W. Va. The company has 2,000 acres of land leased from the U. S. Steel Corporation and the Gilbert Land Company. Present production is coming from a 7½ ft. seam of coal. C. K. Robertson is president and Harry S. Gay, Jr., is vice president and general manager in charge of operations. The loading of the first car was supervised by Tom Gilpin and Don Ellis, who in 1904 assisted the opening of the Gay Coal & Coke Company mine at Mt. Gay, operated by Harry S. Gay, Sr., father of the vice president of the new company.

New Lead-Zinc Plant To Be Built in New Mexico

The U. S. Smelting, Refining & Mining Co., has entered into a contract with the Western Knapp Engineering Co. for the design and construction of a new 250 ton zinc-lead concentrator at its property in New Mexico. Completion of the project is expected some time before the end of the year.

Black Beauty Coal Company Reopens Ruth Mine

Production has resumed at the Ruth Mine since its rehabilitation in April. The property is located in the Rockwood Fields of Somerset County and has been shut down since 1932. Production is between 400 and 500 tons per day and about 80 men are employed. J. F. Neilan is president of the company.

First Aid Contest Scheduled in Kentucky

The 1942 First Aid contests scheduled by the Kentucky Department of Mines are as follows: August 15, Stearns Coal & Lumber Company; August 22, Harlan Mining Institute; August 29, Pond Creek-Tug River Mining Institute; September 12, Western Kentucky Mining Institute; September 19, Kentucky River Mining Institute; September 26, Big Sandy-Elkhorn Mining Institute.

Shortage of Coking and Gas Coals in Germany

The shortage in Germany of coals suitable for use in coke ovens and gas works has caused serious inconvenience, especially in the eastern provinces, and as the output of rich coking coals cannot be increased, it is intended to raise a supply by use of suitable mixtures. The Colliery Guardian reports that it has been found that, for instance, coals of recent formation which are similar to gas coals can yield a good coke if plasticity is diminished by the addition of fine coke dust, coking coal, or coal with a minimum of volatile matter. Similarly, additions of fine coals render non-gaseous coals suitable for carbonization, and it is not necessary that the counter-balancing coals are present in the mixture in proportionate qualities. Small additions, if correctly dosed, will result in appreciable improvement of coking properties, provided care is taken to maintain continuity of supplies of optimum mixtures. A special committee has been formed to lay down rules for grinding and blending coals and to recommend suitable arrangements for the use of coal mixtures in gas works.

Low Grade Lead-Zinc Mine To Be Dewatered

The Chief Consolidated Mining Company has started a rehabilitation program involving unwatering an area containing substantial quantities of low grade zinc ore previously considered unprofitable. Production from these deposits is expected some time later in the year, and the company will obtain the premium prices set up by the Government to stimulate output. Prices received will be 9¼ cents per lb. for lead and 11 cents per lb. for zinc. Cecil Fitch is general manager.

Capacity of the Copper Canyon Plant May Be Increased

The International Smelting & Refining Company is reported to be handling 400 tons of copper ore daily in its new plant at the Copper Canyon property. Plans are said to be under consideration for increasing this capacity.

The Julie shaft has been completed to a point about 50 ft. below the 500 ft. level and a crosscut will be driven to cut the orebody on that level. Diamond drilling is continuing in the Sweet Marie Mine of the company's copper basin ground. J. J. Lillie of Rio Tinto is general manager of operations and Ralph Hayden of Battle Mountain is mill superintendent.

Pilot Mill Planned For Idaho Property

Callahan Consolidated Mining Company is considering construction of a pilot plant at its Rex Mine, according to Donald A. Callahan, president. The company has an opportunity to purchase a milling plant now located near Helena, and, should this be undertaken, the plant will be moved and rebuilt by the Callahan Company.

Eastman Asks Convention Curtailment

On June 19, Joseph B. Eastman, Director of Defense Transportation, called for deferment (for the duration) of all meetings and conventions not closely related to furtherance of the war effort. Pointing to the steady rise in the volume of passenger traffic on railroad and bus lines, Mr. Eastman appealed to the American people voluntarily to impose certain restrictions on their travel.

Vacations should be staggered throughout the year, Eastman said, and vacation travel should be scheduled so that trips would neither start nor terminate on week-ends. Private passenger cars should not now be used for extensive vacation travel, he added.

Non-Ferrous Mining Industry To Have Labor-Management Committees

A. I. Henderson, director of the materials division, announced early in June the establishment of a non-ferrous metals committee to integrate the work of the copper, lead and zinc branches of the War Production Board in connection with the war production drive in non-ferrous metal mines. This committee will work jointly with the labor production division in the establishment of local labor-management committees throughout the mining areas involved. Its major functions will be to keep in close touch with the progress of the war production drive and to arrange for field studies by competent government technicians.

In commending the management of the Anaconda Copper Mining Co., for its cooperative spirit and its leadership in establishing joint labor-management committees at its Butte properties, Mr. Henderson stated: "With this good start, we expect that 'victory committees' will soon be functioning in all the non-ferrous metal mining areas."

Members of the new committee in the materials division are: H. O. King, chief of the copper branch; George Heikes, chief of the zinc branch; and Erwin Vogelsang, chief of the lead branch. Mr. King will head the committee.

Chrome Ore Concentrator in California Completed

The Castro Chrome Associates recently completed and placed into operation its new plant for the concentration of chrome ore. The plant was built at a cost estimated to be $60,000 and it has been under construction for the last three months. L. E. Putnam is superintendent for the company.

Peabody Coal Company Announces Eight Scholarships

The Peabody Coal Company desiring to promote the training of worthy qualified young men for effective careers in the coal industry of Illinois has established eight scholarships in mining engineering in the Department of Mining and Metallurgical Engineering at the University of Illinois. The scholarships are to be administered by the Illinois Mining Institute.

The provisions for awarding and administering the scholarships are outlined below:

1. The Peabody Coal Company wishes to recognize the years of faithful service of employes of the company. Therefore, scholarship awards are preferably restricted to employes, or the sons of employes, or former employes, of the Peabody Coal Company.

2. The Peabody Coal Company operates coal mines in the Counties of Saline, Perry, and Franklin, known as the Southern District, and in Christian, Sangamon, and Vermilion, known as the Northern District. In so far as possible one scholarship each year will be awarded to an applicant from each of the Southern and Northern Districts.

3. The value of each scholarship to be $100 annually, one-half payable at the beginning of the first semester, and one-half payable at the beginning of the second semester, and continuing in this manner for eight semesters, or four years of study.

4. Scholarships shall be awarded to entering freshmen by the University Committee on Assignments to Special Undergraduate Scholarships, from applications certified by the Illinois Mining Institute Committee on Scholarships, upon the basis of experience, character, general ability, high school scholastic record, and/or competitive examination. The recipient of a scholarship to be required to pass a rigid physical examination given by the University Health Service and meet the requirements for admission to the College of Engineering of the University of Illinois.

5. Applications for scholarships should be addressed to: Secretary, Illinois Mining Institute, 28 East Jackson Boulevard, Chicago, Ill.

Depots Established for Buying Small Lots of Chrome and Manganese Ores

Small producers of manganese and chrome ores in the western States may deliver their output in truck or wagon loads to buying depots in the Pacific coast and Rocky Mountain area, according to announcement by Metals Reserve Company this week. Payment is to be made as soon as lots of 10 tons or more have been delivered and analyzed.

New depots for small-lot purchases are being established at Phoenix, Ariz.; Auburn and Tracy, Calif.; Salida, Colo.; Battle Mountain, Nev., and Deming, N. Mex. These are in addition to stations at Yreka, Calif., and Seneca, Grants Pass and Coquille, Oreg. Metals Reserve expects to announce additional depots soon.

A minimum ore content of 35 percent is required as to both manganese and chrome ores, and the $3 per ton penalty on briquetting of chrome ore concentrates has been dropped.

Rubber in Safety Equipment for Mines

Many mining companies have been experiencing increasing difficulties in securing various types of safety equipment such as shoes, hats, respirators, goggles, etc., and this has been particularly true as to safety equipment involving the use of rubber in its construction. To meet this situation, the mining branch of WPB has advised that mining companies, either directly or through their company stores, may apply to Dr. Wilbur A. Nelson, head of the mining branch, for their requirements of safety equipment, on a quarterly basis. The mining branch will then use its best efforts to see that the necessary raw materials, including rubber, are made available to the manufacturer to permit filling these orders.

It is emphasized that applications should be limited to the minimum requirements of safety equipment for each quarter. Mining companies should also use all possible caution to insure that rubber footwear and other items are used for mine service exclusively.

Maximum Prices Established for Used Equipment

On July 1, maximum prices for second-hand machinery and electrical products were established under the terms of maximum price regulation No. 136 on machines and parts by Price Administrator Leon Henderson. His comment on the move was "since the War Production Board has limited the production of much new machinery, there has been a very active demand for many types of second-hand machinery with corresponding increases in prices. In a number of cases the price of a used machine has equalled or exceeded the new price."

Used processing, mining, construction, electrical and railroad machinery and equipment, together with parts of such machines are included in the machines or parts covered by the regulation.

Mining Branch of WPB Again Moves to New Offices

Late in June the Mining Branch of the War Production Board moved from its former offices in the Social Security Building to Temporary Building "R." The new address is Wing 4, First Floor, Tempo "R," Third Street and Jefferson Drive, S. W., Washington, D. C. All sections of the Mining Branch will continue to be housed together, including Chief of Branch Wilbur A. Nelson; Assistant Chief Marcellus H. Stowe; D. L. McElroy, head of the Coal Section; James Douglas, head of the Metals

Section; Edward W. Bauman, head of the Non-Metallics Section; Harry E. Egolf, Jr., head of the Smelter Section; Samuel E. Cobb, head of the Analytical Section; Lane W. Hildreth, head of the Mining Machinery Section; Walter Fitts, head of the Mine Certificate Section; Edward H. Rott, head of the Priorities Section, and Alexander Falconer, assistant, Priorities Section.

U. S. Bureau of Mines Reorganized

Reorganization of the Bureau of Mines has been announced by Dr. R. R. Sayers, Director of the Bureau, in making public an order signed as of June 15 by Interior Secretary Harold L. Ickes. According to the Secretary, the reorganization is designed to "speed the movement of metallurgical processes" which have been worked out by the Bureau "from the laboratory and pilot-plant stage to commercial production." It provides for the setting up of three Regional Offices to operate under Assistant Director R. S. Dean, who will also act as Chief of a Resources and Laboratories Service.

The regional offices are to be located at Salt Lake City for the Western Region, including Alaska, under charge of S. R. Zimmerley; at Rolla, Mo., for the Central Region—which is to include New Mexico as well as the Mississippi Valley States as far east as Indiana and Kentucky—under charge of E. D. Gardner; and at College Park, Md., for the Eastern Region—including also Tennessee, Mississippi and the Southern States—under charge of S. M. Shelton. Regional engineers are to supervise operation of experiment stations in their territories and to carry on investigations directed towards "more rapid use of mineral resources."

The Technologic Branch and its divisions of Mining, Metallurgy and Non-Metals are abolished, and a major part of their personnel is transferred to the Resources and Laboratory Service—including C. F. Jackson as Head Mining Engineer, C. W. Davis as Principal Metallurgical Engineer; P. M. Ambrose as Principal Engineer in Charge of Laboratories Planning, O. C. Ralston as Principal Chemical Engineer, and C. E. Julihn as Principal Mining Engineer.

A Fuels and Explosives Service is established, to which the present Coal Division, Petroleum and Natural Gas Division, and Explosives Division are transferred. A. C. Fieldner becomes head of the Fuels and Explosives Service and also of its Solid Fuels Division, with W. C. Schroeder as Assistant Chief. R. A. Cattell is Chief and H. C. Fowler Assistant Chief of the Petroleum and Natural Gas Division, and W. J. Huff is Consulting Explosives Chemist of the Explosives Division. A. L. Toenges is Principal Coal Mining Engineer in the Fuels and Explosives Service. Laboratories and field offices working on coal at Golden, Colo.; Pittsburgh, Pa.; Bruceton, Pa. (including the Experimental Mine), and College Park, Md., and all field offices relating specifically to petroleum, helium and natural gas are placed under the Fuels and Explosives Service.

The Health and Safety Service remains as at present organized, with Dan Harrington as Chief. It has jurisdiction over all Health and Safety field offices and stations, and over the electrical, mechanical and mine ventilation work of the Central Experiment Station at Pittsburgh. The Health and Safety Branch continues to include also the work of Coal Mine Inspection, Explosives Control and Mineral Production Security (anti-sabotage).

The Economics and Statistics Service also remains as at present organized, with Elmer W. Pehrson as Chief, and with jurisdiction over the statistical activities at the field stations.

All editorial information, public relations, motion picture and graphic art functions of the Bureau are consolidated in a Division of Information, under Allan Sherman as Chief. The Division reports to the Director, and is under the general supervision of the Director of Information of the Department of the Interior.

The Administrative Branch and position of Assistant to Director are abolished by Secretary Ickes' order, and in their place the office of Administrative Assistant is provided. This office has not yet been filled. John A. Davis and J. E. Secrest are designated Assistants to the Administrative Assistant.

Road Bill Will Aid New Mine Development

The Highway Defense Act of 1941, a bill recently signed by the President, provides $260,000,000 for road construction, of which $10,000,000 is made available for access roads to sources of raw materials. Certification of the need for such roads is to be made by the Chairman of the War Production Board, and it is understood that a report by the Bureau of Mines or the Geological Survey, or both, indicating that the potential yield of critical minerals justifies construction, will continue to be a requisite. The mining access road feature was placed in the bill by Senator Carl Hayden of Arizona.

Unsuitable Coking Coal May Prove Useful

Comprehensive tests made by the Bureau of Mines on certain coals, heretofore considered unsuitable for wartime production of coke and its by-product, show that these coals probably can be used for such purposes. Dr. R. R. Sayers, Director of the Bureau, recently reported that tests completed by James T. McCartney and Joseph D. Davis of the Bureau of Mines, indicate that some of the "borderline" coals can be used with comparative safety if proper measures are observed. "Borderline" coals are those whose physical prop-

erties are in doubt. Some of these coals may expand when heated and some cause extensive damage to coke ovens. Several blended coals were also investigated by the technicians and some of these responded favorably to the tests. A copy of the report containing the experiments is contained in R. I. 3644, entitled "Expansion of Coal During Coking," by James T. McCartney and Joseph D. Davis.

Clinton H. Crane Honored at Rolla

At the 69th commencement exercises of the School of Mines and Metallurgy, Rolla, Mo., Clinton H. Crane, president of the St. Joseph Lead Co., received the honorary Doctor of Engineering degree. Dr. Crane delivered the commencement address, paying tribute to the work of the engineer and the power-driven machine in their effect upon mankind in its strivings for life, liberty and the pursuit of happiness.

He said, "More and more the power-driven machine has come to help the human hand. Let me emphasize the power-driven machine, not the machine alone. I have seen the productivity of the individual worker increased from six to sixty fold in my own lifetime. Compare the 5 yd. or 12-ton electric shovel in one of our open pit mines and the 20-lb. shovel in the hands of an old time miner. It should be plain that only by the aid of power machinery has it been possible to produce so much more than our forefathers did, and it is only because we are producing more per man in the United States, that we are able to command such a disproportionate share of this world's goods. It needed a setting such as ours, where power-driven machines have been used to enable the same men to produce more, rather than the disturbing condition where less men produce the same amount, to have so quickly reaped the benefits of the machine age.

"All of us, just as in the case of the individual worker, have benefited from this increased production," Dr. Crane continued. "When I first visited the Lead Belt, men were receiving $1.00 for ten hours' work and only $6.00 a week. Today the average wage is $50.00 a week and men are only working eight hours a day. Housewives no longer draw water from a well, trim whale oil lamps and wash clothes by hand. Everyone has an automobile, and a greater variety of food is on every American table at all seasons of the year than was in the banquet halls of Kings in olden times."

Dr. Crane said that during this same period, no such progress has been made in other lands which, a century and a half ago, were just as untouched and just as rich in natural resources as these United States. "Our advances," he pointed out, "pronounce a tribute to the system of free enterprise, to the freedom from governmental interference, and the almost total lack of class feeling in America."

Dr. Clinton H. Crane, president of the St. Joseph Lead Company, received the honorary Doctor of Engineering Degree at the Commencement of the Missouri School of Mines and Metallurgy. Left to right, Dr. Curtis L. Wilson, Dean of the School; Dr. Crane and Dr. Frederick A. Middlebush, president of the University of Missouri

"Guide" to Government Work in Wartime Washington?

By One Who Has Been Through the Mill

TO PERFORM administrative work in the Government at Washington all you need is an office, a desk with three buzzers on it, two oak boxes, and a secretary in the next room. As soon as you have gotten seated at your desk in the office, three huge porters move two strangers in with you, and you sit around awhile, and silently hate one another. Finally, your telephone is connected. By this time you have learned your secretary's name. They then change the number on your office door. As a result of this and because all the offices and all the secretaries look alike, you get into another office by mistake when you come back from lunch; you work there for several days before you discover it isn't yours. Eventually, you get back into your office. By this time you have a new secretary with a name that sounds like Zrrshvitt, and you are ready to go to work which leads you to glance at the two oak boxes on your desk. People come into the office periodically and put papers into one of the boxes. It is your job to get them out of that box and into the other one, whence they will go to someone else.

Put the junk in two piles on top of your desk. Try each day to get most of it changed over from one pile to the other; then you can go home. Next day, get most of the stuff back into the other pile, dripping a little into the wastebasket, and dribbling some into the other basket—"Outgoing box." **Be sure to check your name off the attached list or they'll bring it back to you.** By this time, a new accumulation will be found in the incoming box.

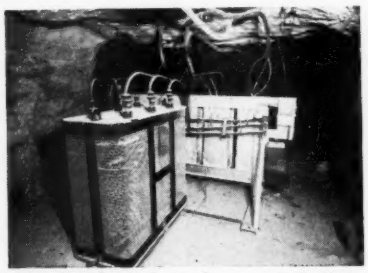
In time, the piles get so high you decide to report sick and stay home for a few days, hoping a lot of the junk will somehow vanish during your absence. It won't. When you come back, the pile is two feet high; you have a new secretary; the position of your buzzer buttons is different and your telephone number has been changed; three more desks have been moved into your office, and your name is not any longer on the door. There is a note on your desk addressed to Joe. It reads, "It's on my desk, but I haven't had a chance to read it yet, I'm swamped." You open a lower desk drawer and a squirrel hops out. The place where your building is, was a park just six weeks ago. At this point there is nothing you can do but holler, or at least get into a conference.

A conference is a slightly organized method of wasting time. Habitual conferences have unhappy home endings. Most conferees have unhappy home lives and would rather sit in the office and jaw each other rather than go home and be jawed. During the average two-hour conference, there is a lot of: "I'll contact Joe on that," and "My thought is, we better table that for a week." Finally, the chairman says, "Let's get together tomorrow for two hours"; and you stumble back into your office blind from the poison gas you have been breathing. The piles on your desk have grown still higher. The building has only two stories, so you can't leap to your death from it. Your secretary would probably shoot you if she were there, and you wouldn't have to ask her, for she is well trained. Anyhow, it's already ten o'clock, so you curl up in the desk drawer and sleep fitfully until dawn, when it starts all over again.

MANUFACTURERS' Forum

Air-Cooled, Fire-Proof Transformer

The Westinghouse Electric and Manufacturing Co., East Pittsburgh, announces that its air-cooled, fire-proof transformers with Class B insulation, in sizes from 150 to 500 kva., are entering new fields. Two are particularly interesting. One is underground, as in coal mines. In one West Virginia installation a Westinghouse 165-kva., 2,300-volt, three-phase air-cooled transformer is replacing three single-phase oil-cooled units. A similar unit is being used 950 ft. underground in a metal mine in Wyoming, as an integral part of a 300-kw. ignitron-rectifier substation. The air-cooled transformer is almost



This 300 kva Westinghouse unit is 700 ft. underground in a mine of the Union Potash and Chemical Company, Carlsbad, New Mexico. As the mining work progresses, the transformer is loaded onto a car and hauled to a new location. The largest size oil transformer that could be used in this fashion had only one-half as much capacity.

ideal for underground work because it eliminates hazards of fire and explosion of such concern in mines. In addition, the light weight and small dimensions of the unit are said to make it particularly desirable for handling underground, where clearances are small and facilities for handling heavy objects are limited.

A particularly severe test of this air-cooled transformer idea was afforded in a potash plant. A unit was installed in such a plant in New Mexico in the fall of 1940. Although it is located in an atmosphere laden with rock-salt dust, the only servicing that has been required is a periodic blowing out. A logical extension of the air-cooled, fire-proof insulation idea is to smaller distribution transformers and to small power transformers. These have been air-cooled before, but never used the Class B insulation that renders them fire-proof.

A Spray for Treating Burns

Quick, painless application of a treatment for burns is now available by merely pressing the valve on a dispenser bottle, which liberates a fine, steady spray of tannic acid to cover the burned areas. The tannic acid is fully prepared, needs no mixing prior to application, and is ready for instant use.

This unit is one of the features of the new Bullard emergency burn kit announced by the E. D. Bullard Company, 275 Eighth Street, San Francisco, Calif. Besides the tannic dispenser bottle, the Bullard kit contains castor oil for eye burns and a complete assortment of treatments and dressings. The units are packed in an attractive wooden case, natural finish, that is easy to open and that offers complete dustproof protection to the dressings. With industrial activity at its all-time peak, and with so many briefly trained men and women at work, this effective emergency kit for burn treatment is designed to protect workers from unnecessary pain and scarrings from industrial burns and is said to promote rapid healing.

Rubber Shortage Produces Larger Vocabulary for Drivers

American motorists and truck drivers have some words to become more familiar with when calling at the garage to have worn pneumatic casings recapped. Paul V. McLaughlin, manager of repair material sales of the B. F. Goodrich Company, Akron, Ohio, has listed the following:

Camelback: The rubber compound used in replacing the tread on a worn tire. It can be made with varying percentages of crude rubber, reclaim rubber, other ingredients.

Top cap: Camelback applied just across the top of the tire after the worn tread has been buffed off.

Skid depth: The distance between the top and the bottom of the tread design on the finished recapped tire.

Buffing: Roughening the old tread surfaces and taking off surface rubber to present a uniform surface for the camelback.

Cementing: Applying cement to the roughened tire surfaces.

Carcass: A tire body exclusive of the tread.

Mold: A piece of equipment designed to convey heat to the tire so the new tread, or recap, may be vulcanized or "cured" and the cement flow so uniform adhesion takes place.

Matrix: A circular metal shell, which impresses the tread design into the camelback during the cure.

Curing tube: A heavy rubber tube inserted in the tire and inflated to provide pressure which forces the camelback into direct contact with the matrix, thus assuring that the tread design will be correctly imprinted in the recap.

Cure: The application of heat for definite periods to vulcanize or cure the recap and adhere it to the tire.

Improved Wagon Drill for Deep Holes

New features have recently been added to the X-71WD Drifter, manufactured by Ingersoll-Rand Company, 11 Broadway, New York. This drifter has been developed for wagon drill service, in which the drilling of deep holes is usually required. New features include a positive method of blowing—a method which directs more blowing air through the drill steel. Thus little air is said to escape around the sides of the shank.

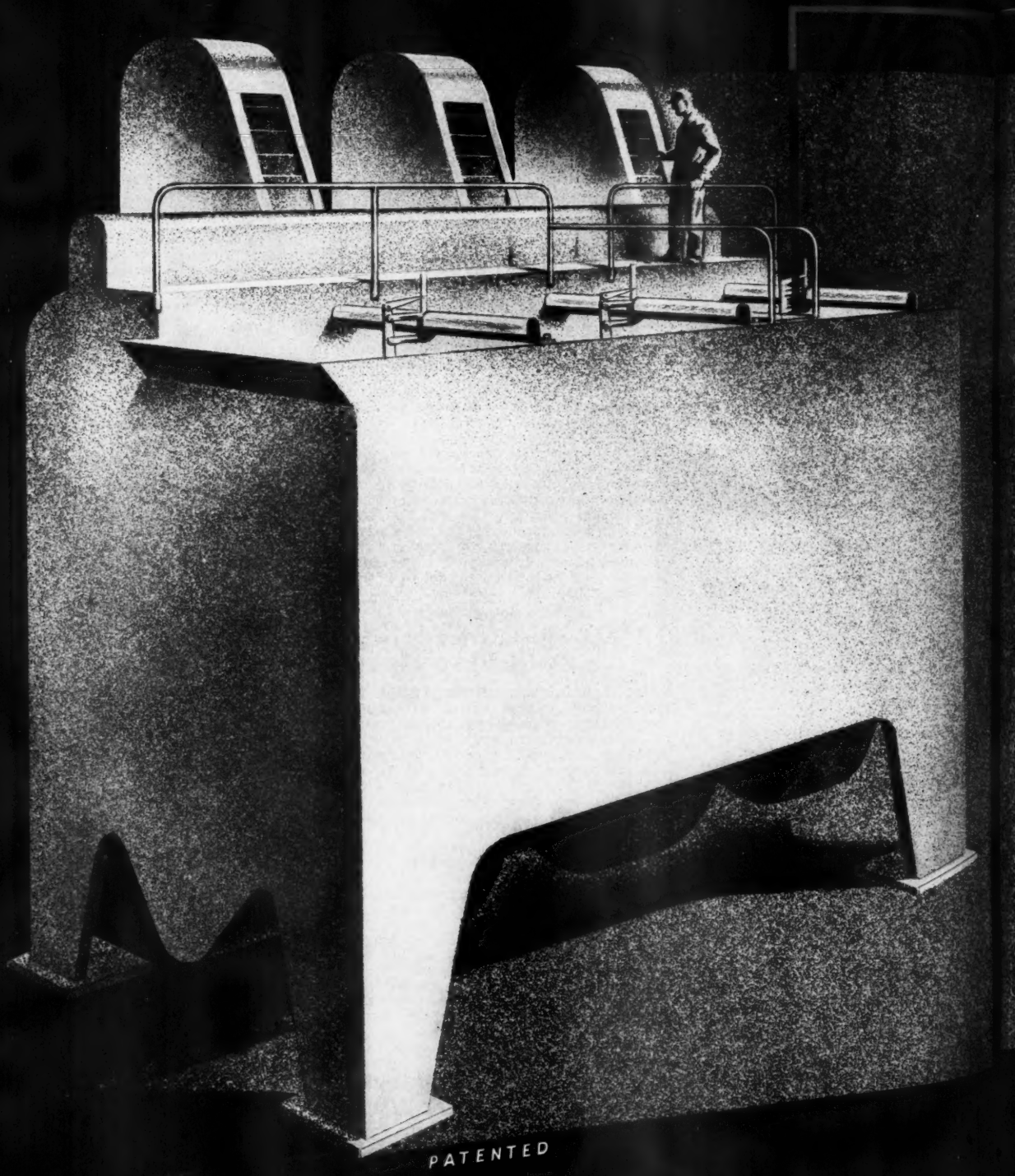
This is considered a major improve-

An improved feature of this deep hole wagon drill is a method of blowing more air through the drill steel

ment over the method formerly used, since it virtually eliminates the wastage of air and directs a strong, steady current to the bottom of the hole—where it is needed for cleaning.

The X-71WD is said to have a longer stroke and a heavier piston

A GREAT DEVELOPMENT



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For the past ten years Jeffrey has maintained a steady and increasing program of research and development on Jigs.

Today, with recent developments, Jeffrey has an outstanding jig for metallurgical coals.

JEFFREY JIGS for the "TOUGH" JOBS

New features and improvements have been added to our complete line of jigs . . . a jig for every requirement.

THE JEFFREY MFG. CO.

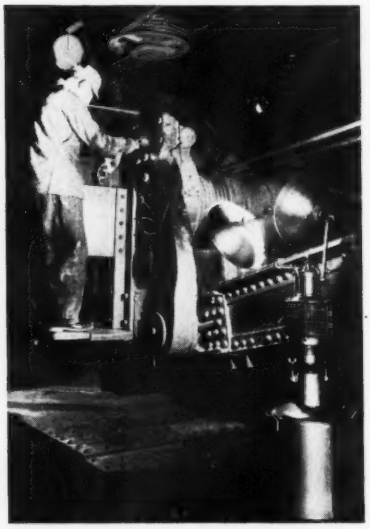
COLUMBUS • OHIO

than any other drill made today. These features provide strong rotation and striking force necessary to overcome the inertia of a heavy drill steel; they also permit the use of larger bits.

Floodlights for Routine and Emergency Night Jobs

National Carbide Corporation, 60 East Forty-second Street, New York, announces that its new line of portable floodlights is a thoroughly dependable source of adequate lighting for construction and repair work, for routine railroad checking jobs, or for any emergency use.

The new NC-200 model (illustrated), which is the largest unit now being made, has two 8,000 candlepower floodlights constructed on swing joints, thereby allowing independent directional control with 16,000 candlepower concentration of light. This portable floodlight may be used continuously or intermittently, and is always ready for instant use until the carbide charge is exhausted.



Gang Channel Nuts Available for Testing on Industrial Applications

Elastic stop gang channel nuts, widely applied in the aircraft industry, are now offered by the Elastic Stop Nut Corporation, 2332 Vauxhall Road, Union, N. J., for testing on the many applications in general industry where a multiple, self-locking, bolted fastening is required. Among the uses for these strips of self-locking nuts are for cover and inspection plates, around windows and doors, and at other points where a series of fastenings is required.

The strips are factory-assembled, and it is necessary only to rivet or otherwise fasten them to the structure where they are to be used. Elastic stop gang channel nuts are furnished in standard 6-ft. straight lengths in a wide variety of nut sizes, thread systems, spacing, materials, and finishes. Nut sizes range from No. 8 through ⅜-in. bolt diameters. Spacings vary from ⅝ to 3-in. between centers, depending upon the size of nuts and the character of the application. The nuts are furnished without countersink for regular blind mounting or countersunk for flush mounting.

Substitutes for Tin-Base Babbitts

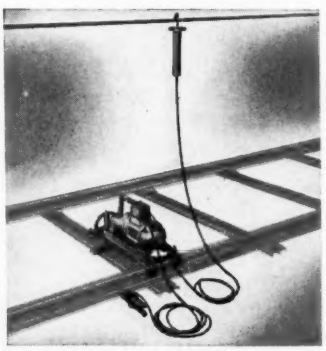
Two new lead-base bearing metals, known as Pyramid and Defender, have been developed by the Magnolia Metal Company, 120 Bayway, Elizabeth, N. J., as substitutes for tin-base babbitts which are now so difficult to secure. The Pyramid metal is said to be well suited to applications where bearings must withstand heavy sustained pressures. The Defender metal stands shocks without cracking and is well suited for use in internal-combustion engines, trap-rock crushers, and sifter machinery.

For steady high speeds and uniform loads, such as are found in line shafting, electric motors of 10 to 250 hp., pumps and general machinery, the makers offer their Magnolia anti-friction metal.

Light-Weight Electric Rail Drill

The Ohio Brass Company, Mansfield, Ohio, announces its development of a new lightweight rail drill, known as the O-B Electric Mobildrill. It is especially developed for use with wedge-type rail bonds, and is designed to drill a ⅝ or ¾-inch hole in the web of the rail. The drill motor operates on 250 volts d.c. and will drive a hole in 40-lb. mine rail in approximately 40 seconds.

Weighing less than 60 lbs. the device may be skidded along the rail from joint to joint or it may be carried by means of a convenient handgrip. Connections to rail and trolley wire are made by means of an O-B junior plier-type clamp and junior fused trolley tap, respectively. The latter affords fused overload protection.



Drilling height is adjustable for rail from 20 to 90 lbs. and the rear of the drill assembly is supported by an adjustable platform, mounted on a ball and socket joint, to handle rough bottom conditions. The drill is fed into the rail web by means of a handwheel operated screw feed.

Self-Aligning Idler for Conveyor Belts

Chain Belt Company, Milwaukee, Wis., announces a new self-aligning idler for flat conveyor belts, both return and carrying, which will help to keep the belt central on its supporting idlers, important for longest possible life from a conveyor belt.

The operation of this self-aligning idler is sensitive and instantaneous. If for any reason the conveyor belt runs to one side it has a tendency to swivel the idler in a horizontal plane. If this in itself is not sufficient to cause the idler to swing enough to force the belt to throw back immediately, the belt will continue traveling to one side until it contacts the counterweighted end disc, which is slightly larger in diameter than the idler roll. Contact with the counterweight tends to rotate it, but since it is a counterweight it resists this tendency to rotate and produces a counterforce on the idler. This causes the idler to swivel rapidly, throwing the idler more out of line, which then immediately forces the belt to swing back the other way.

New Welding Rod

To conserve nickel for our war effort, so that it can be used where it will do the most good, the American Manganese Steel Division of the American Brake Shoe & Foundry Company, Chicago Heights, Ill., now has available a new manganese steel welding rod known as V-Mang.

An alloy steel containing 12 to 14 percent manganese, molybdenum and other elements, this electrode has resulted from research started by Amsco's metallurgists several years back looking for a better welding rod. It will replace Amsco nickle-manganese steel electrodes, except in a few exceptional cases, thus conserving this critical metal without hampering reclamation of manganese steel and other ferrous equipment parts, so necessary at this time. While molybdenum is costlier than nickel, V-Mang rod will be priced the same as Amsco nickel-manganese steel rod.

New Babbitt Metal

A new babbitt metal for bearings subject to high pressures and temperatures has been developed by Magnolia Metal Company, Elizabeth, N. J. This metal, known as Power Nickel Genuine Babbitt, has a tensile strength of 17,500 pounds per square inch, a yield point of 65,000 pounds per square inch, a Brinnell hardness of 27, and its pouring temperature ranges from 950 to 1,000 degrees Fahr. The high softening and melting temperatures make the metal resistant to extreme local heat. Its un-

usual strength makes the metal adapted to very heavy bearing loads, such as are encountered in railroad service, heavy rolling mill machinery, and paper mill machinery. The nickel treatment gives the metal a hard glossy surface, desirable for generators, motors and other high-speed application.

Barrel Carrier

A new drum and barrel carrier was recently announced by the Ernst Magic Carrier Sales Company, Buffalo, N. Y.

This new model is designed to handle light wood, fiber, and "one-trip" light gage steel containers with or without chimes.

Its capacity is 800 lbs. and will accommodate drums and barrels from 14-in. to 24-in. diameters.

Three-wheel construction balances

the load for safer and easier moving of containers. Operation is simple. One man can attach the clamp, pull down on the handle, lift the container off the floor a few inches, and move it any distance. Another important feature is the straight, vertical lift of the barrel from the floor to prevent any flowing over of contents from open-head containers.

Cutter Heads for Shop Use

McKenna Metals Co., 168 Lloyd Ave., Latrobe, Pa., announces a method by which simple facing cutter heads may be made in almost any shop.

Designed with a large negative spiral angle of 35 to 55 deg. and positive hook of 15 to 25 deg. this cutter is said to mill steel efficiently only because Kennametal does not "gall" or permit the adherance of steel chips to the hard, strong, non-galling tool tip which "skids" the steel chip off smoothly at these angles.

For roughing, with cuts up to ⅜-in. deep, a 35 deg. negative helical angle and 15 deg. positive hook on a 12-in. diameter cutter head has been found to work efficiently. For light finishing cuts a negative helic of 55 with 20 deg. positive hook angle is most efficient. The hook angle should be less on a smaller diameter head.

Catalogs and Bulletins

BALL MILLS. *Hardinge Co.*, York, Pa. Bulletin No. 13D describes and illustrates features of the company's conical mill. Specifications of ball mills and pebble mills made by the manufacturer, together with installation drawings are also included. Pp. 28.

The company recently issued a leaflet listing available rebuilt ball and pebble mills for delivery on short notice. Pp. 1.

CARBIDE TOOLS. *McKenna Metals Co.*, 1000 Lloyd Avenue, Latrobe, Pa. The company recently issued a small booklet entitled "Instructions for Users of Kennametal Steel Cutting Carbide Tools." Pp. 47.

CLEANING CUTTING OILS. *Gale Oil Separator Co., Inc.*, Chrysler Bldg., New York, N. Y. Folder describes the company's method of cleaning used cutting oils. Pp. 4.

COMPRESSORS. *Worthington Pump & Machinery Corp.*, Harrison, N. J. Bulletin L-611-B8A describes and illustrates the manufacturer's single horizontal, single stage compressors, Types HB and HS. Pp. 5.

The company recently issued a booklet entitled "How Worthington Serves Industry." It lists the various types of equipment manufactured by the company, and illustrates the numerous industries where its machinery is used. Pp. 11.

CONSERVING RUBBER. *U. S. Rubber Co.*, 1790 Broadway, New York, N. Y. The company has recently issued a useful manual entitled "First Aid to Industry in Conserving Rubber." It contains timely suggestions how a user of mechanical rubber goods can obtain best possible results with hose, transmission belts, conveyor belts, electrical wires and cables, rubber-lined equipment, and other rubber containing industrial products. Pp. 45.

CONVEYOR BELTS. *B. F. Goodrich Co.*, Akron, Ohio. The company has just issued Catalog Section 2800, a volume entitled "Care and Maintenance of Conveyor Belting and Elevator Belting." It contains instructions for the care and maintenance of belting, as well as chapters containing a wide range of belt data, useful when considering installation or repair problems. Pp. 24.

ELECTRICAL EQUIPMENT. *Allis-Chalmers Mfg. Co.*, Milwaukee, Wis. The company has recently published a new handbook entitled "A Guide to Wartime Care of Electric Motors."

Emby Products Co., 1800 W. Pico Blvd., Los Angeles, Calif. The company describes and illustrates its various sizes of photo-electric cells for industrial applications.

General Electric Co., Schenectady, N. Y. GEA 3756 describes and illustrates features of the manufacturer's 25-ton diesel electric locomotive for industrial switching. Pp. 16.

I-T-E Circuit Breaker Co., 19th and Hamilton Streets, Philadelphia, Pa. Bulletin 4205 is entitled "Protection of Mercury Arc Rectifiers Against Backfires." Pp. 4.

Ohmite Manufacturing Co., 4835 Flournoy Street, Chicago, Ill. Catalog 18 is offered as a buying guide and a quick reference specification booklet listing the manufacturer's rheostats, resistors and many other stock items. Pp. 16.

Roller Smith Co., Bethlehem, Pa. Catalog 3130 describes and illustrates the manufacturer's indoor oil circuit breakers, Class 50-TC, having continuous carrying capacities ranging from 600 to 3,000 amperes at voltages up to 15,000 volts. Pp. 12.

Catalog 2150 entitled "Indoor Air Circuit Breakers," Type HD describes and illustrates the manufacturer's low voltage air circuit breakers for use on alternating current circuits up to 600 volts and direct current circuit of 250 or 750 volts. Pp. 12.

The Trumbull Electric & Mfg. Co., Plainville, Conn. Circular 337 illustrates and describes new features of the low voltage drop enclosed busbar distribution system. Pp. 4.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Company announces a new Catalog Section on Sectional Resistors for AC and DC Circuits. These new resistors are said to be much easier to install and consume a great deal less power. They are available in ratings from 250 to 30,000 volts for switchboard mounting or portable use. Pp. 8.

ELECTRICAL RESISTANCES. *Keystone Carbon Co., Inc.*, St. Marys, Pa. Bulletin describes the company's negative temperature, co-efficient resistant material developed to compensate for resistance changes due to temperature variations. Pp. 4.

LUBRICATION. *Trabon Engineering Corp.*, 1814 E. 40th Street, Cleveland, Ohio. Bulletin 423 describes the design and operation of the company's lubricating system, suited for lubricating coal mining machinery, conveyors, crushers and other mining equipment. Pp. 4.

MAGNETIC SEPARATORS. *Stearns Magnetic Mfg. Co.*, Milwaukee, Wis. Bulletin 81 describes and illustrates the manufacturer's magnetic separators for selective separation and concentration, particularly in the mining industry. The new bulletin also includes description of the Stearns-Wetherill Type "R" magnetic separator, on which many changes in design have been effected; the Stearns Ring Type "D"; Drum Type "MD" and the Wet Type "MW" magnetic separators. Pp. 16.

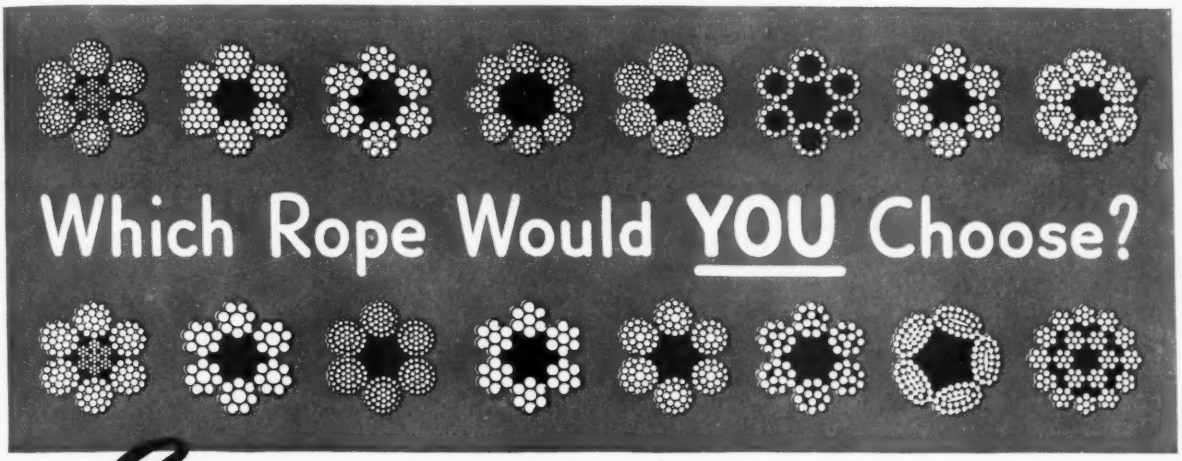
PUMPS. *Worthington Pump & Machinery Corp., Harrison, N. J.* Bulletin W-312-B2C describes features and lists specifications of its single stage Type L, Nos. 3 to 6 centrifugal pumps. Pp. 4.

Chain Belt Co., Milwaukee, Wis. Bulletin 400 illustrates and describes the company's 1942 line of Rex centrifugal water pumps made in capacities ranging from 3,000 g.p.h. to 125,000 g.p.h. Included in the bulletin are data on how to pick a pump for a specific job.

Ingersoll-Rand Co., 11 Broadway, New York City. Bulletin No. 7167 describes the features of the manufacturer's Class GT two-stage centrifugal pumps. The bulletin contains 28 photographs and cross-sectional views, performance tables and a comprehensive tabulation showing friction of water in various sizes of pipe. 12 pp.

RECONDITIONED MACHINERY. *Morse Bros. Machinery Co.*, Denver, Colo. Stock list 421 names the reconditioned machinery available for general mining, power plants, machine shops, and industrial and contractors equipment. Complete ore-milling machinery from 25-ton to 125-ton flotation plants are listed, together with equipment for a 50- or 250-ton cyanide plant. Pp. 32.

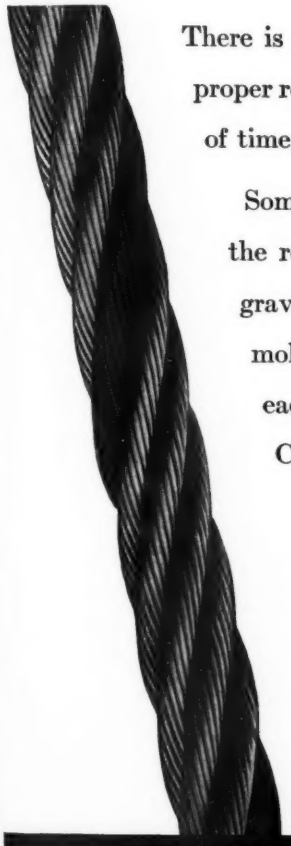
INDEX TO ADVERTISERS



Which Rope Would YOU Choose?

Economy DEPENDS ON THE RIGHT CHOICE

(Reading Time: 30 seconds)



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Some machines have sheaves which impose severe bending strains on the rope. On some machines the cable drags through abrasive stone, gravel or rock. Some ropes must endure the heat of handling ladles of molten metal, while others must run at excessively high speeds. For each job there is a one best rope, not only in construction but grade. Consult an American Cable engineer.

Ask him also about American Cable **TRU-LAY PREFORMED** wire rope. **TRU-LAY** has set new and higher standards for wire rope service. Conserve steel, time and money by using the proper construction and grade of **American Cable TRU-LAY Preformed.**

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